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THIS STUDY REPRESENTS A SEARCH FOR A SYSTEM OF DETERMINING THE AMOUNT OF LAND REQUIRED TO CONDUCT THE EDUCATIONAL PROGRAMS OFFERED BY THE CALIFORNIA PUBLIC SCHOOLS. DATA IS CONTAINED IN TABLES THAT PROVIDE A BASIS OF DETERMINING THE SITE SIZE FOR A SCHOOL THAT IS BEING DESIGNED TO SERVE A SPECIFIC ENROLLMENT SIZE AND GRADE LEVEL RANGE. THE SITE FACTORS INCLUDED WERE--(1) LAND FOR OUTDOOR PHYSICAL EDUCATION (2) DEVELOPED BUILDING SITE (3) PARKING AND ACCESS ROADS (4) PERCENT FACTOR FOR LAYOUT. SITE REQUIREMENT CATEGORIES INCLUDED WERE--(1) SMALL SCHOOLS (FEWER THAN 7 CLASSROOMS) (2) ELEMENTARY GRADES (3) GRADES 7 THROUGH 9 (4) GRADES 9 THROUGH 12. SUPPORTING THIS DATA ARE DIAGRAMS OF SPACE MODULES REPRESENTING THE VARIOUS FACILITY LAYOUTS. MODULE COMBINATION DEPENDS ON THE VARIOUS ENROLLMENT SIZES GIVEN. TO FACILITATE THIS ANALYSIS, A BRIEF SEQUENTIAL SITE PLAN DEVELOPMENT PROCEDURE AND LIST OF ESSENTIAL SITE SURVEY DATA ARE INCLUDED. (MH)

SCHOOL SITE ANALYSIS AND DEVELOPMENT

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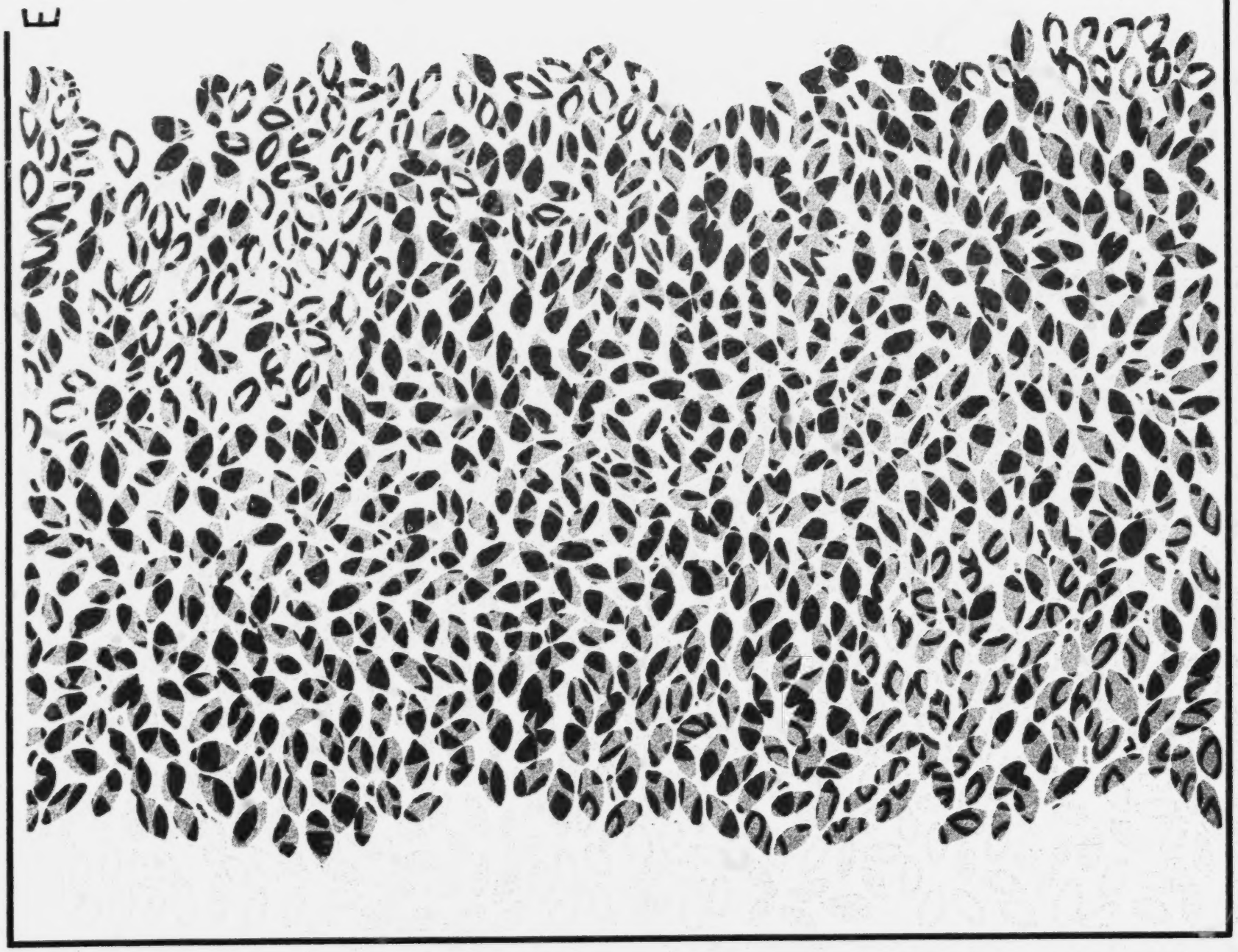

CALIFORNIA STATE DEPARTMENT OF EDUCATION
Max Rafferty, Superintendent of Public Instruction
Sacramento 1966

SCHOOL SITE ANALYSIS AND DEVELOPMENT

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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FOREWORD

The provision and maintenance of high quality educational programs is the function of California public schools. The schools must have facilities that are both appropriate and adequate for this function. Responsibility for the provision of such facilities is shared by all citizens, but the governing board and administration of each school district have major roles in determining the facilities required. And the State Department of Education has responsibility for making available to these groups the information they need as a basis for making sound and practical decisions. The Department meets this responsibility through the Bureau of School Planning in the Division of Public School Administration and Finance.

The Bureau of School Planning, since its inception approximately 40 years ago, has worked closely with the governing boards and administrators of California school districts in determining the facility and site requirements for each school that was being planned. In doing this work the Bureau has accumulated valuable information regarding the best solutions for each of the many problems encountered in school site selection and development. This information provides a firm basis for the recommendations presented in this publication, and its use for this purpose makes it possible to present recommendations that ensure good practice and satisfactory results.

Although the Bureau has responsibility for site approval, the final decision for the selection and development of a school site is a responsibility of the school district. The State Department of Education, however, is deeply interested in the district having the information it needs as a basis for this decision and hopes that the information presented in this publication will be of value for this purpose.

Max Rafferty

Superintendent of Public Instruction

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ABOUT THIS STUDY

This study is essentially a search for a better method to determine the amount of land required for the facilities needed to conduct the educational programs offered by California public schools. The results of this study provide a basis for the educator, the architect, and the school planner to interpret the functions of the site and to determine the amount of land required for the functions.

Education has changed and is changing rapidly in the twentieth century. New school buildings and the way the sites are developed reflect these changes.

Years ago when land was inexpensive, school districts usually bought very small sites. Many elementary schools with enrollments from 500 to 1,000 were built on one- or two-acre sites, and high schools with enrollments from 2,000 to 3,000 seldom had sites of more than ten acres. These sites were so small, it was impossible to provide more than a modicum of playground space or outdoor facilities for physical education, and there was no opportunity to expand the existing plant.

Although most of the elementary school buildings used during that period have been replaced, many readers may recall vividly their essential features. Those in the cities were generally two- or three-story block masonry buildings above rather high basement spaces, and they contained eight or more classrooms. The rooms were large to accommodate the very large class sizes so common at that time.

The fire and panic hazards of these schools were very great. Many were demolished because they were unsafe. The outdoor play areas were very small and inadequate. Only very small sites were required for these schools and their limited outdoor facilities.

From the period roughly between World War I and World War II, great strides were made in the science of school planning. Following World War I, there was a trend in California toward "mission style" architecture which resulted in the single-story elementary school, one classroom deep on an arcade or open corridor. During this same period, schools were expanding their programs so that there was need for health and feeding facilities, specialized administrative quarters, auditoriums, and libraries. The program expansion frequently included physical education programs that required outdoor education

facilities that in many instances occupied from 50 to 80 percent of the site. The combination of single-story design and expanding educational programs resulted in the need for larger school sites.

The "mission style" school of the 1920s evolved into the "finger plan" school of the 1930s. This plan is characterized by building wings usually 30 to 40 feet apart that contain four or five classrooms in line with an open corridor on one side and an "outdoor classroom" on the other side. This architecture made possible the use of bilateral daylighting and cross-ventilation.

The louvers, baffles, and wide overhangs used for controlling daylight make these buildings easily identifiable. Many of these are graceful plants with sheltered but noninstitutional characteristics. They are generally on ten-acre sites. Refinements in this "finger-plan" concept of elementary schools continued through the 1950s.

Since about 1960, the basic organization of the school and the classroom as a self-contained teaching station has been questioned by educators and architects. Thus, we have various patterns of "cluster plans" developing which offer great interior flexibility within space shells so that various patterns of team-teaching and large and small groups can be accommodated as well as self-contained classroom programs. Fortunately, the new developments in school design do not require additional land acreage, for there is a general trend toward more compactness in building design.

The "finger-plan" elementary school was commonly accepted for many years. School planning agencies formulated "rule-of-thumb" recommendations for site sizes. The Bureau of School Planning in California, for example, has suggested:

> For elementary schools there should be provided a minimum site of five acres, plus an additional acre for each 100 pupils of predicted ultimate enrollment. Thus, an elementary school of 200 pupils would have a site of seven acres.

This was in line with recommendations for site size by states throughout the nation and by the National Council on Schoolhouse Construction. The research for this guide makes apparent the need for establishing detailed site requirements and using them rather than simply using a "rule-of-thumb."

A GUIDE FOR DETERMINING SCHOOL SITE REQUIREMENTS

Ideally, a school district would hire a professional planner or architect to prepare site studies on the various sites under consideration to determine as accurately as possible the amount of land needed for the school when the enrollment for which it is master planned is reached. The Bureau of School Planning has encouraged school districts to adopt this practice, and some of them have responded favorably, but the governing boards of many districts, especially those in areas where land prices are not exceptionally high, still prefer to invest in a little excess land rather than pay for the required professional service. In the latter instance, they may buy ten acres because that is what they bought last time or because that is what they think the state planners recommend. However, in areas where land is expensive or is just not available in sufficient quantity, as is true today in some urban centers in California, the governing boards are generally willing to finance the recommended study of site requirements. Even when the studies are made, the boards frequently vote for the purchase of sites that are too small. Money considerations are commonly the causes of such decisions.

This guide offers a valid technique for school administrators and governing boards of school districts to determine more accurately than was previously possible the land requirements for new schools. However, the task continues to be a do-it-yourself project for each district. The formulas are flexible enough to permit each district to tailor its final answers as it wishes and, as necessary, to meet conditions which are unusual or exceptional.

A district is responsible for deciding whether it will buy the amount of land determined by following the procedures explained in this guide. However, the board will know whether it is the amount of land needed as determined by the use of the information in this guide. If the board is buying less than this amount, it can determine what elements of the school program will be eliminated or curtailed.

HOW THE GUIDE WAS BUILT

The following factors were analyzed to determine the acreage required for the facilities needed on a school site and to permit the development of a workable and desirable layout:

Outdoor physical education facilities
Buildings, walkways, and landscaping
Parking and access roads
A percentage factor to facilitate the layout of the site Master Plan

The land required for these factors is the total acreage required for the sites. The following sections of this guide point out the importance of the factors and direct attention to basic considerations in dealing with the factors.

LAND FOR OUTDOOR PHYSICAL EDUCATION

The physical education program of a school is the most influential factor in determining the amount of land necessary for the school program. If a well planned and adequate program is desired, the area required for its operation must be provided, and if the school site is to be used for community recreation, additional land must be provided for this purpose. Any reduction in the land provided will necessitate similar reductions of the physical education program or other functions. Community recreation needs can be met most economically by using school sites and facilities to supplement parks and other community recreation facilities. Provisions for activities such as picnicking and outdoor theater presentations may be highly desirable.

A few elementary schools and many high schools have provided for a summer recreational program of aquatics. The facilities used for this purpose are also used for the school's physical education program.

This study assumes an outdoor physical education program which complies with, but does not exceed, the legal requirements of the California Education Code and those of good practice which conform to recognized standards of adequacy now existing in California schools.

Since the facilities are determined by the program, the outdoor physical education activities conducted by a school must be enumerated. For elementary school pupils, the activities break down basically into rhythms, games, stunts and tumbling, and those involving the use of apparatus. The program may provide for the following:

RHYTHMS
- Fundamental skills development
- Creative rhythms
- Singing games
- Folk and square dancing

GAMES
- Tag and running games
- Ball games
- Track and field
- Individual and dual games (hopscotch, four-square, skipping rope, and the like)

STUNTS AND TUMBLING
- Rolling
- Balancing

ACTIVITIES USING APPARATUS
- Climbing
- Swinging
- Balancing
- Pushing and Pulling
- Hanging

Most rhythm activities require areas with hard surfaces such as asphalt or concrete. Running games and ball games require turfed areas. The various apparatus used for activities such as climbing, tumbling, and gymnastics require a soft or padded ground cover such as tanbark.

Good practice and safety require that appropriate instructional areas be constructed for the children of various age groups for schools with more than six classrooms. The general age-group pattern is kindergarten; grades one through three; and grades four through six. Hard surfaced areas, turfed field areas, and apparatus areas should be provided for each group.

For schools with six classrooms or fewer, outdoor facilities should be combined. Thus, there would be only one turfed field area, one hard surface area, and one apparatus area for the entire school.

In 1960, the State Department of Education published a bulletin for determining the facilities and space allocation needed for physical education outdoor teaching stations for schools of various sizes. The approach was based on an analysis of activities and on scheduling for each class throughout the day. A study was made to determine what percent of time children of various ages would spend in various programmed activities.

As a result of this study, a teaching station was defined as being adequate for one class to be taught by one teacher at one time, with the pupils wasting no time waiting turns because of lack of space and facilities. The tables in this guide for school site analysis and development are based on this definition and therefore present a breakdown of actual space requirements and equipment for each required teaching station.

LAND FOR DEVELOPED BUILDING SITE

There are many ways to lay out a Master Plan. The school buildings may be spread out into wings, wrapped around courtyards, or blocked together into compact clusters. Almost no two school plans anywhere are identical, and the various patterns and forms which have been implemented in California schools are almost infinite.

Land for the developed building site includes the land required for the buildings and the land adjacent to the buildings which might be developed as paved areas, walkways, lawn area, outdoor classrooms, or courtyards. For convenience of terminology in this study, this land is designated as the areas required for buildings and grounds. Excluded are the areas for parking, service areas, and outdoor physical education and recreation facilities.

The Bureau of School Planning maintains a current file of the working drawings of all schools that are submitted to the bureau for approval in the two-year period. In addition to these drawings, the bureau maintains a permanent file of plans of schools which are selected for reference because they represent superior planning concepts.

A repeated analysis of many of these plans reveals a pattern or ratio between developed grounds area around the buildings and the building areas themselves. This ratio is approximately 2:1. Few schools, either elementary or secondary, are designed in such a way that the developed land area is more than twice the building area. In most instances it is slightly less. The bureau believes that in those cases where the grounds exceed this ratio to any appreciable amount, the maintenance costs increase for landscaping beyond the budget of the average district. In those cases where the developed grounds area is extremely limited (some schools which have replaced lawn areas with asphalt paving), the total effect is a setting for a school which is depressing and sterile. Most districts provide well-kept and well-landscaped grounds even if maintenance costs require that the total grounds area be somewhat restricted. The bureau does not recommend that the landscaped grounds area be less than the total building area or exceed twice the building area. For purposes of this guide, it has therefore been assumed that the land purchased will permit the ratio between developed grounds and building area to be approximately 2:1.

The tables in this guide are based on the following state-aid area allocations:

- 55 square feet per pupil for kindergarten and grades one through six
- 75 square feet per pupil for grades seven and eight
- 85 square feet per student for grades nine through twelve

The ratio of 2:1 between building grounds and building area is maintained in all instances.

Typical Problem: Assume a K–6 school for anticipated enrollment of 640 pupils. Each pupil will generate 165 square feet for the building plus adjacent grounds. Thus, the school will need 105,000 square feet or about 2.4 acres for the "developed building site." The tables show a total of 2.7 acres to permit planning concepts which separate the kindergarten from the rest of the school facilities.

LAND FOR PARKING & ACCESS ROADS

Parking areas, bus loading areas, and access roads are normal requirements of most schools. The minimum parking provided for a one-classroom school is generally for five to six cars, or five parking spaces for the public, plus one space for the teacher. Parking areas for small schools are arranged so these schools use a combined parking area and bus loading area. Minimum space required for this arrangement is about .3 acre, plus 280 square feet for each auto stall.

Larger elementary schools and junior high schools generally provide one and one-half parking spaces for each teacher and each staff member. Therefore, if this formula were used, an 18-classroom elementary school would have parking for 18 teachers, one principal, one clerical worker, and ten extra spaces for visitors.

If the parking and bus loading areas for a school are designed separately, the architect may plan to use about 15,000 square feet for the bus loading areas, plus 300 square feet per parking space and access roads. A K–6 school requiring 30 parking spaces would therefore require about 15,000 square feet, plus 9,000 square feet, or 24,000 square feet total. This is approximately .6 acre. Included in this figure is the land around parking lots, the land between the parking lots, the turn arounds, and the frontal street. The tables developed for parking acreage requirements for kindergarten and grades one through eight in any combination include these elements.

Secondary schools generally provide additional land for student auto parking. This land permits those students who drive cars to park on the school site rather than congest street parking throughout a neighborhood. In some instances such parking is not paved, but it is generally graveled and drained. The amount of land required remains the same regardless of the surface used. When student parking areas are located to permit their use by the public attending athletic events, more land than is needed for student parking must be provided as determined by the capacity of the gymnasium or stadium. In recent years the bureau has recommended a minimum parking capacity for student lots to be based on 50 percent of the school enrollment. Thus, a 2,000 student parking area at 300 square feet per car requires 300,000 square feet, or about seven acres of land in addition to that needed for staff and visitor parking. This amount of land is usually adequate for all school purposes.

The table for secondary school parking shows recommended total area requirements which include the elements.

PERCENT FACTOR FOR LAYOUT

Usually it is not possible to lay out required facilities such as play fields which have critical dimensioning and also critical relationships to other elements of the Master Plan in such a way that all elements fit together as pieces in a jigsaw puzzle. Even if this were possible, it would not be desirable. Rectangular elements would require a rectangular site of exactly the right dimensions. Any natural attribute of the site, such as trees or knolls, would be sacrificed. There would be no space between various play areas for safety lanes and buffer areas to permit large groups of children to move freely on the site. Also, every site should have free space for the small undefined activities which invariably become necessary as the school is used. Outdoor instruction areas and nature study activities are valuable assets. Younger children need garden spaces, digging areas, and other spaces for imaginative and creative play.

The table for determining site requirements includes a percentage factor which accounts for these various requirements and permits the layout of the programmed facilities. This factor varies from 30 percent for very small schools to 10 percent for large schools. This percentage factor varies because schools tend to grow and also because the more elements which are to be planned on a site, the greater the efficiency possible in placing these elements within the frame of the site boundaries.

Some sites will require more land than recommended by the tables even though the acreage is defined as usable acres. Land in cuts, steep hills, gullies, creeks, scrub, marshland, or in flooding areas is not considered usable land, although such land can contribute to the school plant. An excess of 30 percent of the site in such land is considered a serious liability in terms of site maintenance.

HOW TO USE THE TABLES AND LAYOUTS

The tables in this guide contain information regarding facilities and land requirements that provide a basis for determining the site size for a school that is designed to serve a specified number of grades and school enrollment. The suggested site acreage is based on the total land area required for facilities, including land for buildings, parking, and outdoor physical education spaces. Each of the various outdoor physical education spaces is represented by a letter that is keyed to the layout of the facility. A number before a letter indicates the number of units of the physical education facilities required. Layouts for the various types of physical education facilities are presented with their correct dimensions.

The following tables are provided:

Table 1, page 14, contains data for schools with fewer than seven classrooms. These small schools pose special problems. The site factors, including outdoor physical education facilities and parking, are minimal. The outdoor spaces are by necessity compromised because pupils of various age groups must use the same facilities. Nevertheless, many areas in California are so sparsely populated and so isolated that these small schools are valid. The school districts are unable to make a projection of growth that requires more than six classrooms.

Table 2, page 16, contains data for schools with more than six classrooms. The outdoor facilities required for the schools relate to the grade level of the pupil enrollment. This table is divided to show the outdoor areas required for kindergarten activities; the outdoor facilities for grades one, two, and three; and those required for grades four, five, and six.

Table 3, page 18, contains data for schools with grades seven, eight, and nine. These tables should be used to determine the site requirements for grades seven and eight; seven, eight, and nine; or eight and nine. When grade six is placed in a school with grade seven, the outdoor facility requirements for grade six enrollment are considered the same as for grade seven. When grades five and six or grades four, five, and six are placed in combination with upper grades to form groupings commonly referred to as "middle schools," the outdoor facility requirements for grades

four, five, and six shall be determined by the table for elementary schools.

It should be noted that when grade nine is included with grades seven and eight, the requirements for space and facilities increase appreciably. This is because the ninth grade programs usually introduce some of the physical education activities commonly associated with a high school. Even though a school which includes grade nine in its organization does not offer a program requiring such facilities as a track or a baseball field, land should be purchased that would permit the introduction of these activities in the program at a future date.

Table 4, page 20, contains data for high schools. This table should be used to determine the site requirements for grades nine, ten, eleven, and twelve, or any combination of these grades.

EXAMPLE

The tables in this guide are designed so that the same procedure employed in using any one of the tables can be employed in using all the other tables. This procedure is illustrated as follows by establishing a hypothetical problem and using the table for elementary schools with over six classrooms:

Step 1

Determine what age groups are to be served.

For example, assume that the school to be planned will provide for children of kindergarten age and for pupils in grades one through six. The projected enrollment will be 430.

Step 2

Determine the projected enrollment in (1) kindergarten; (2) grades one, two, and three; and (3) grades four, five, and six.

Kindergarten enrollment (up to 55 pupils may be taught in one classroom in two half-day sessions)	50
Grades one, two, and three enrollment	190
Grades four, five, and six enrollment	190
Total	430

Step 3

Refer to appropriate table to determine acreage required.

• Read down in column titled "One Classroom" to find the land requirements for one kindergarten	.3 acre
• Read down in column titled "Enrollment up to 300" to find the land requirements for grades one, two, and three	2.7 acres
• Read down same column to find the land requirements for grades four, five and six	5.8 acres
Total	8.8 acres

FACILITY LAYOUTS

Each of the facilities referred to in the tables by a letter is illustrated and dimensioned in one of the layouts on pages 21 through 34. This provision should be of special value to architects. For example, if an architect wants to know the hardcourt requirements for up to 300 pupils in grades four, five, and six, he should refer to the illustration labeled F, which shows that for 300 pupils, an area of 32,000 square feet is required. Basic unit F is a space module of 80 feet by 100 feet, and four of these units are required. These four modules may be blocked into various geometrical patterns or planned as separate units. Therefore, the layout shown should be treated as being only one of many that might have been illustrated.

The illustration also suggests that the hardcourt area provide for four basketball courts and six volleyball courts, plus an area for miscellaneous games such as tetherball, hopscotch, four-square, and shuffleboard. The architect may arrange these areas as required to meet any particular problem with which he is faced and as necessary to meet program requirements. He is free to make the site layout he thinks best, provided the appropriate number of modules is included and the facilities are identified and dimensioned.

Table 1

SITE REQUIREMENTS FOR SMALL SCHOOLS

Schools with fewer than seven classrooms

	Grades 1 Through 6					
Number of Classrooms	*1*	*2*	*3*	*4*	*5*	*6*
Type of Outdoor Facility			**Number Required**			
A Field Area 90′ x 120′				1	2	1
B Hardcourt Area 60′ x 75′			1	1	1	1
C Apparatus Area (3200 Square Feet)	1	1	1	1	1	1
D Field Area 180′ x 180′	1	1	1	1	1	2
F Hardcourt Area 80′ x 100′	$\frac{1}{2}$	1	1	1	$1\frac{1}{2}$	$1\frac{1}{2}$
Percent Factor for Layout	**30**	**30**	**30**	**25**	**25**	**20**
Area Use			**Number of Useable Acres Required**			
Physical Education	1.2	1.3	1.4	2.0	2.4	2.7
Buildings and Grounds	.2	.3	.3	.4	.5	.6
Parking and Roads	.2	.2	.3	.3	.4	.4
Total Acreage	**1.6**	**1.8**	**2.0**	**2.7**	**3.3**	**3.7**

Grades 1 Through 8

Number of Classrooms	1	2	3	4	5	6
Type of Outdoor Facility	**Number Required**					
A Field Area 90′ x 120′				1	1	2
B Hardcourt Area 60′ x 75′			1	1	1	1
C Apparatus Area (3200 Square Feet)	1	1	1	1	1	1
F Hardcourt Area 80′ x 100′	$\frac{1}{2}$	1	1	1	$1\frac{1}{2}$	$1\frac{1}{2}$
G Field Area 260′ x 260′	1	1	1	1	1	1
Percent Factor for Layout	**30**	**30**	**30**	**25**	**25**	**20**
Area Use	**Number of Useable Acres Required**					
Physical Education	2.2	2.3	2.5	2.7	2.8	3.0
Buildings and Grounds	.2	.3	.3	.4	.5	.6
Parking and Roads	.2	.2	.3	.3	.4	.4
Total Acreage	**2.6**	**2.8**	**3.1**	**3.4**	**3.7**	**4.0**

Table 2

SITE REQUIREMENTS FOR ELEMENTARY GRADES

Schools with more than six classrooms

Kindergarten

Number of Classrooms	1	2
Type of Outdoor Facilities (square feet)		
Turfed Area	3,000	5,500
Paved Area	2,000	4,000
Apparatus Area	2,000	2,500
Land Required for Buildings and Grounds	2,400	3,600
Total Square Feet Required	9,400	15,600
Percent Factor for Layout	20	20
Useable Acres Required TOTAL	.3	.5

NOTE. If the school includes grades 7 and 8 or 7, 8, and 9, see Table 3 for increases in the site requirements

Enrollment
Type of Outdoor Facility
A Field Area 90′ x 120′
B Hardcourt Area 60′ x 75′
C Apparatus Area (3200 Square Feet)
D Field Area 180′ x 180′
E Field Area 120′ x 180′
F Hardcourt Area 80′ x 100′
Percent Factor for Layout

Area Use

Physical Education
Buildings and Grounds
Parking and Roads
Total Acreage

Grades 1, 2, and 3					Grades 4, 5, and 6				
Up to 75	*76 to 150*	*151 to 300*	*301 to 450*	*451 to 600*	*Up to 75*	*76 to 150*	*151 to 300*	*301 to 450*	*451 to 600*
Number Required					**Number Required**				
1	1	2	2	4					
1	2	4	6	8					
1	2	3	4	5	1	2	3	4	4
					1	2	4	4	4
								2	4
					1	2	4	6	8
15	15	10	10	10	20	15	10	10	10
Number of Useable Acres Required					**Number of Useable Acres Required**				
.5	.7	1.3	1.9	2.4	1.2	2.4	4.4	6.0	7.4
.4	.6	1.1	1.6	2.1	.4	.6	1.1	1.6	2.1
.2	.3	.3	.4	.4	.2	.3	.3	.4	.4
1.1	1.6	2.7	3.9	4.9	1.8	3.3	5.8	8.0	9.9

Table 3

SITE REQUIREMENTS FOR GRADES 7 THROUGH 9

Grades 7 or 8, or Grades 7 and 8

Enrollment	*Up to 75*	*76 to 150*	*151 to 300*	*301 to 450*	*451 to 600*	*601 to 750*	*751 to 900*	*901 to 1050*	*1051 to 1200*
Type of Outdoor Facility	**Number Required**								
G Field Area 260′ x 260′	1	1							
H Field Area 260′ x 460′			1	1	1	1	2	2	2
I Field Area 240′ x 300′					1	1			1
J Hardcourt Area 90′ x 100′	1	2	3	3	4	4	5	5	6
K Hardcourt Area 100′ x 120′				2	2	3	3	3	3
P Apparatus Area (1000 Square Feet)	1	2	2	3	3	3	4	4	4
Percent Factor for Layout	**30**	**30**	**25**	**25**	**20**	**20**	**15**	**15**	**15**
Area Use	**Number of Useable Acres Required**								
Physical Education	2.1	2.7	4.3	5.0	7.0	7.1	8.5	8.5	10.7
Buildings and Grounds	.6	1.4	2.1	2.7	3.2	3.7	4.2	4.7	5.2
Parking and Roads	.2	.3	.3	.4	.4	.5	.6	.7	.8
Total Acreage	**2.9**	**4.4**	**6.7**	**8.1**	**10.6**	**11.3**	**13.3**	**13.9**	**16.7**

Grades 7 and 8 or Grades 7, 8, and 9

Enrollment	*Up to 75*	*76 to 150*	*151 to 300*	*301 to 450*	*451 to 600*	*601 to 750*	*751 to 900*	*901 to 1050*	*1051 to 1200*
Type of Outdoor Facility	**Number Required**								
G Field Area 260′ x 260′			1		1	1			
H Field Area 260′ x 460′				1			1	1	1
J Hardcourt Area 90′ x 100′	1	2	3	3	4	4	5	5	6
K Hardcourt Area 100′ x 120′				2	2	3	3	3	3
L Field Area 360′ x 360′	1	1	1	1	1	1	1	1	1
M Field Area 300′ x 750′					1	1	1	1	1
P Apparatus Area (1000 Square Feet)	1	2	2	3	3	3	4	4	4
Percent Factor for Layout	**30**	**30**	**25**	**25**	**20**	**20**	**20**	**20**	**20**
Area Use	**Number of Useable Acres Required**								
Physical Education	4.2	4.5	6.5	8.7	13.4	13.7	15.4	15.4	15.7
Buildings and Grounds	.8	1.6	2.3	3.0	3.6	4.2	4.8	5.4	6.0
Parking and Roads	.2	.3	.3	.4	.4	.5	.6	.7	.8
Total Acreage	**5.2**	**6.4**	**9.1**	**12.1**	**17.4**	**18.4**	**20.8**	**21.5**	**22.5**

Table 4

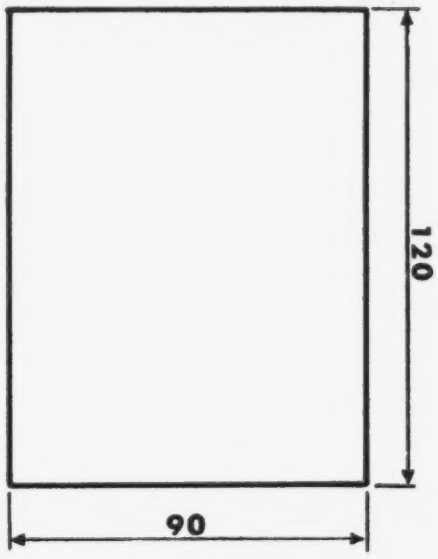
SITE REQUIREMENTS FOR GRADES 9 THROUGH 12

NOTE. If the school program is to include aquatics and both swimming and diving pools are required, increase the site requirement .6 of an acre

Any Combination of Grades 9, 10, 11, and 12

Enrollment	*Up to 400*	*401 to 600*	*601 to 800*	*801 to 1000*	*1001 to 1200*	*1201 to 1400*	*1401 to 1600*	*1601 to 1800*	*1801 to 2000*	*2001 to 2200*	*2201 to 2400*
Type of Outdoor Facility	**Number Required**										
G Field Area 260′ x 260′			1			1	1				
H Field Area 260′ x 460′				1	1	1	1	2	2	2	2
K Hardcourt Area 100′ x 120′	2	2	3	3	3	3	3	3	4	4	4
L Field Area 360′ x 360′	1	1	1	1	1	1	1	1	1	1	1
M Field Area 300′ x 750′	1	1	1	1	1	1	1	1	1	1	1
N Hardcourt Area 100′ x 110′	3	4	5	5	6	6	6	7	7	7	8
O Field Area 200′ x 360′		1	1	1	1	1	1	1	1	2	2
P Apparatus Area (1000 Sq.Ft.)	2	3	3	4	4	5	5	6	6	7	7
Percent Factor for Layout	**25**	**20**	**20**	**20**	**20**	**15**	**15**	**15**	**15**	**10**	**10**
Area Use	**Number of Useable Acres Required**										
Physical Education	11.9	13.8	16.2	17.7	18.0	19.0	19.0	20.7	20.8	22.0	22.2
Buildings and Grounds	3.3	4.0	5.1	6.2	7.3	8.4	9.5	10.6	11.6	12.6	13.5
Parking and Roads	2.1	3.6	4.4	5.2	6.0	6.8	7.6	8.4	9.2	10.0	10.8
Total Acreage	**17.3**	**21.4**	**25.7**	**29.1**	**31.3**	**34.2**	**36.1**	**39.7**	**41.6**	**44.6**	**46.5**

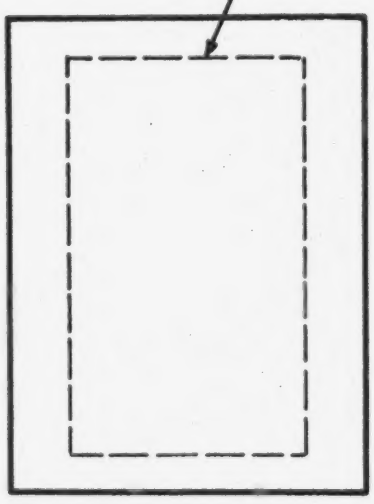
LAYOUTS OF PHYSICAL EDUCATION FACILITIES



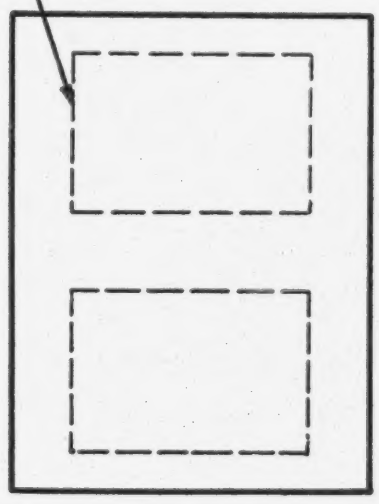
BASIC UNIT A

SPACE MODULE 90′ x 120′

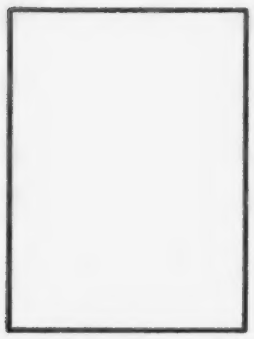
Instructor may mark with chalk lines courts to make:
1 teaching station of end soccer 60′ x 100′



or
1 teaching station of 2 hand polo courts 40′ x 60′ or other field games as desired for grades 1, 2, 3

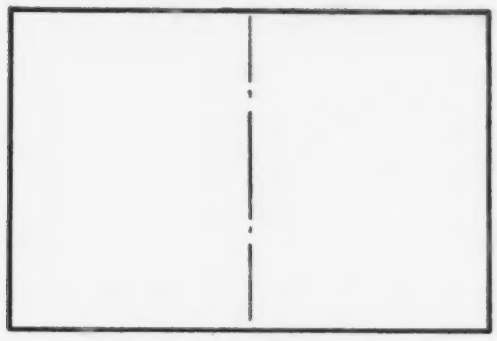


FIELD AREAS FOR GRADES 1, 2, and 3



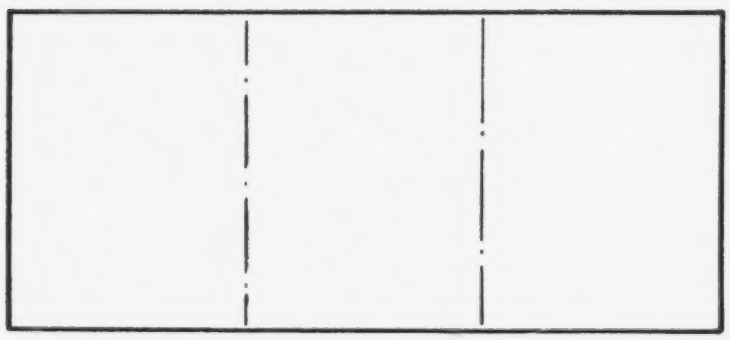
UP TO 150 ENROLLMENT

10,800 sq. ft.
UNIT A



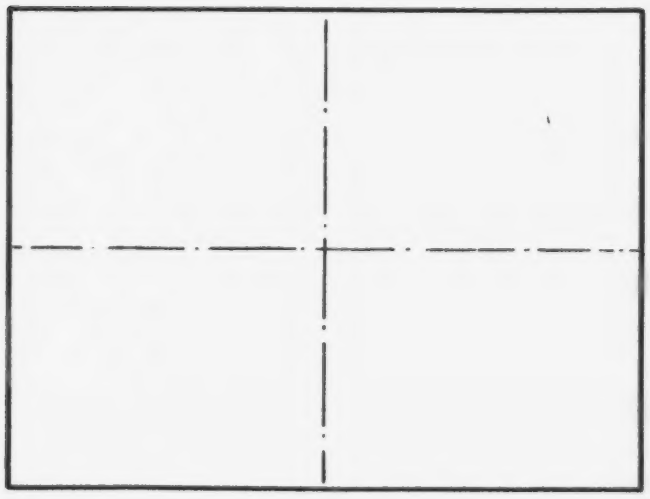
300 MAXIMUM ENROLLMENT

21,600 sq. ft.
2 UNITS OF A



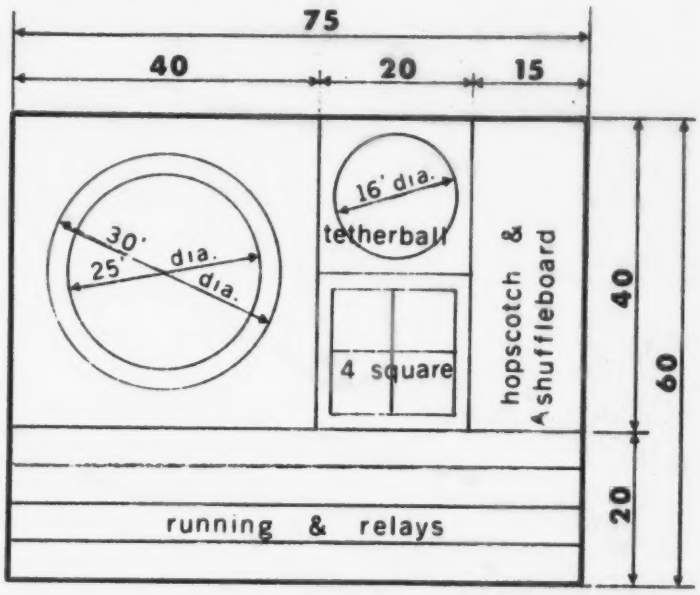
450 MAXIMUM ENROLLMENT

32,400 sq. ft.
3 UNITS OF A



600 MAXIMUM ENROLLMENT

43,200 sq. ft.
4 UNITS OF A

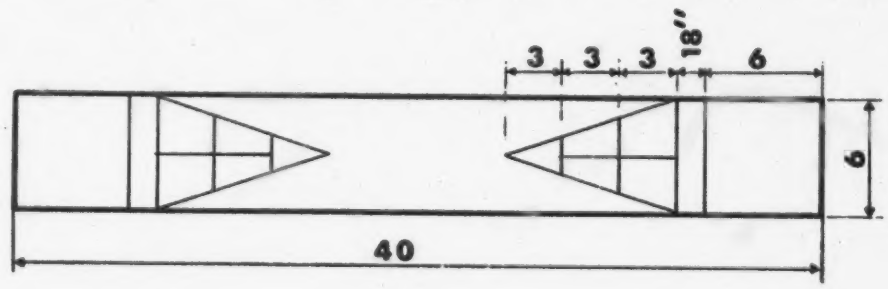


BASIC UNIT B

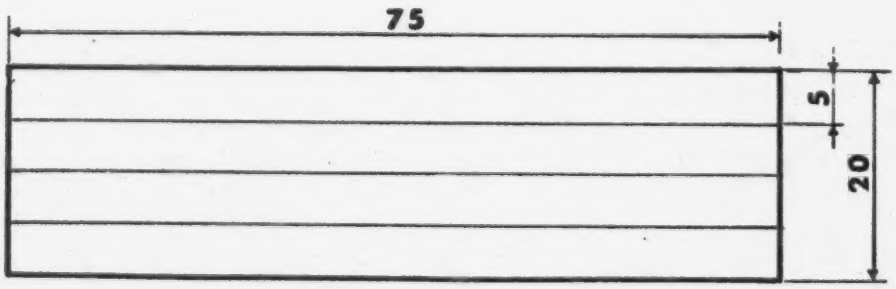
SPACE MODULE 60' x 75'

showing typical activities
for 75 children

LAYOUT WILL VARY



SHUFFLEBOARD

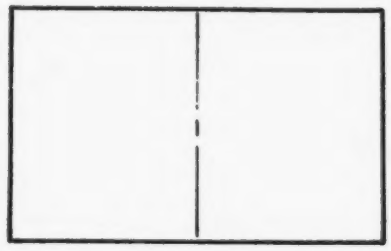


RUNNING & RELAYS

HARDCOURT AREAS FOR GRADES 1, 2, and 3

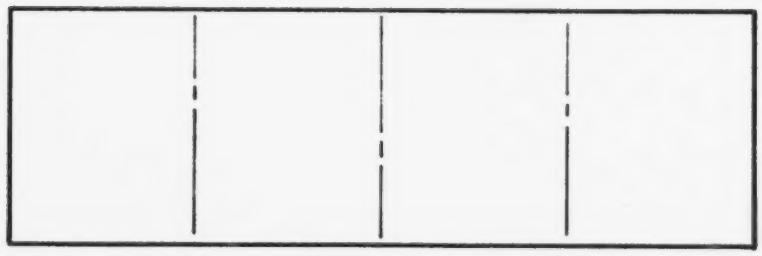
UP TO 75 ENROLLMENT

4,500 sq. ft.
UNIT B



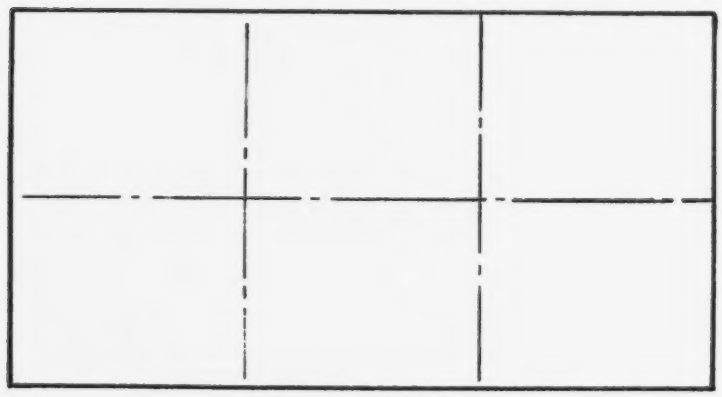
150 MAXIMUM ENROLLMENT

9,000 sq. ft.
2 UNITS OF B



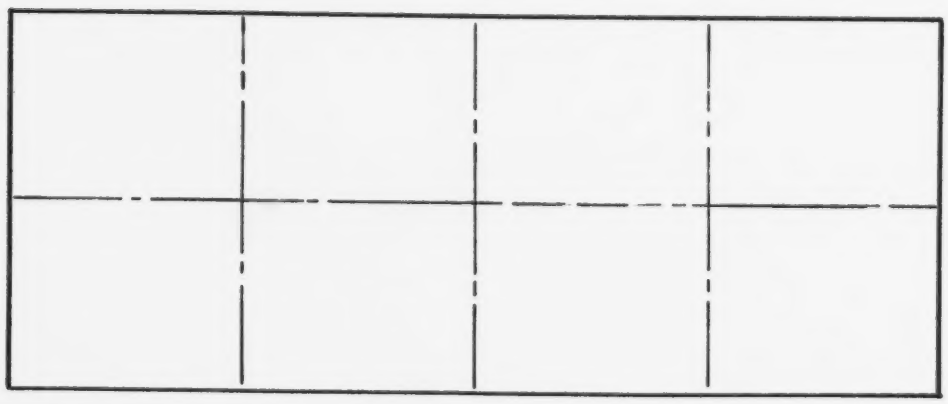
300 MAXIMUM ENROLLMENT

18,000 sq. ft.
4 UNITS OF B



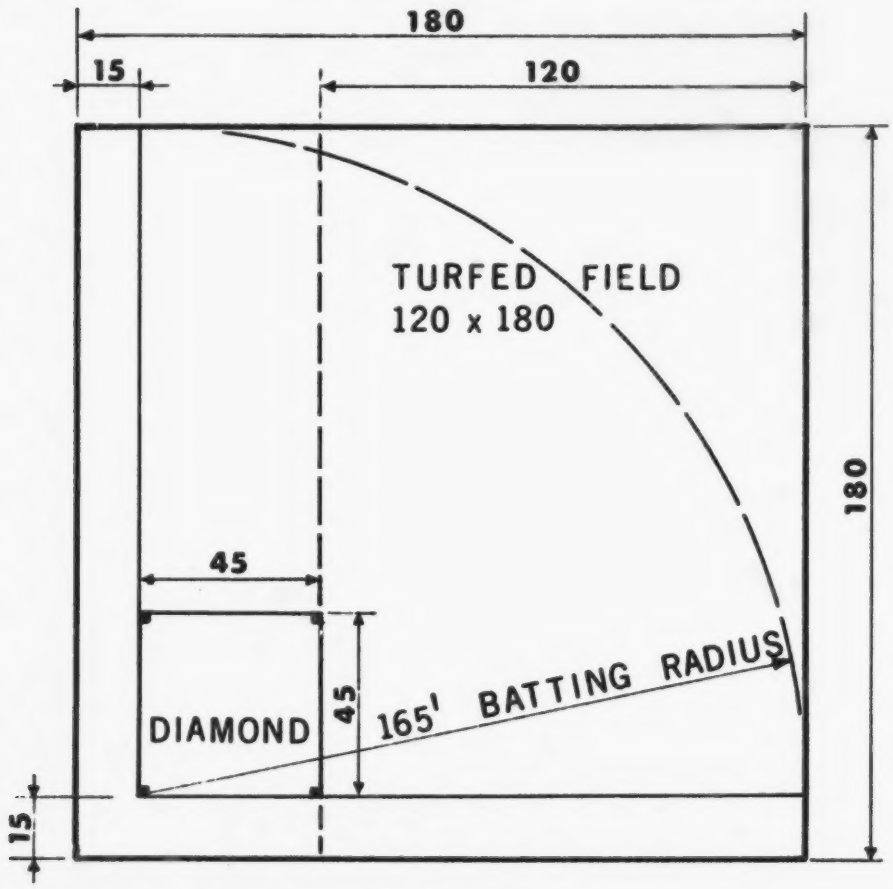
450 MAXIMUM ENROLLMENT

27,000 sq. ft.
6 UNITS OF B



600 MAXIMUM ENROLLMENT

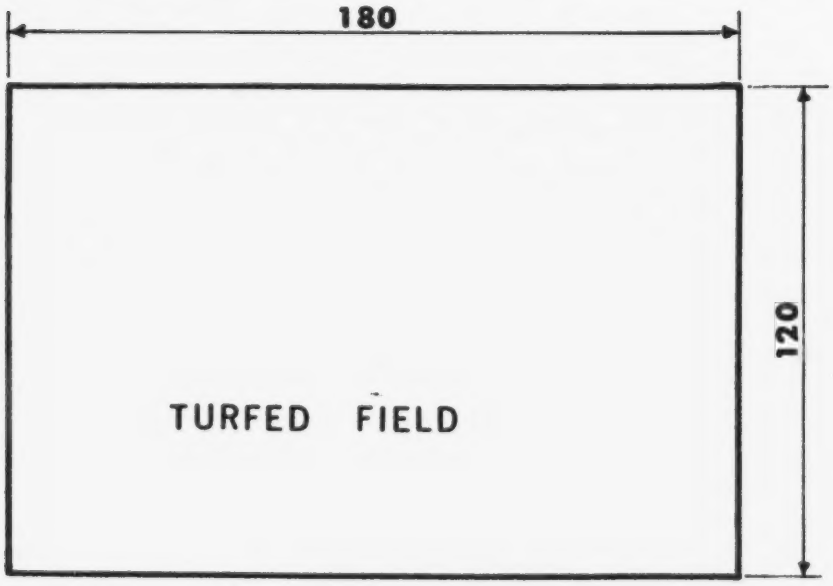
36,000 sq. ft.
8 UNITS OF B



BASIC UNIT D

SPACE MODULE 180′ x 180′

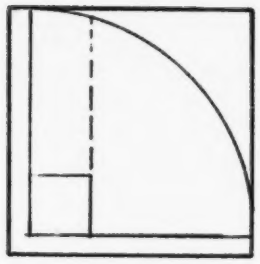
combined use for softball
or field areas



BASIC UNIT E

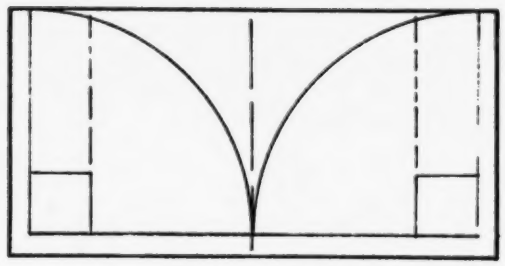
SPACE MODULE 120′ x 180′

FIELD AREAS FOR GRADES 4, 5, and 6



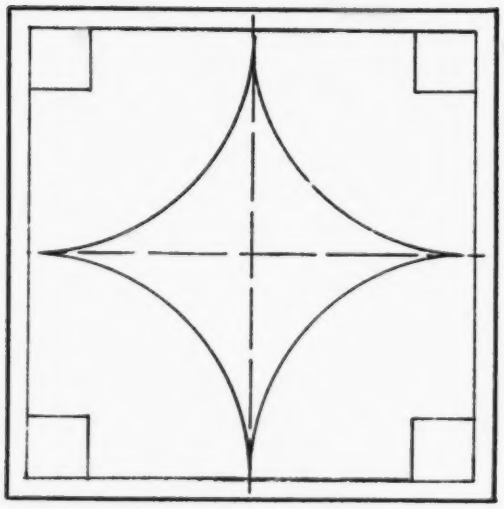
UP TO 75 ENROLLMENT

32,400 sq. ft.
UNIT D



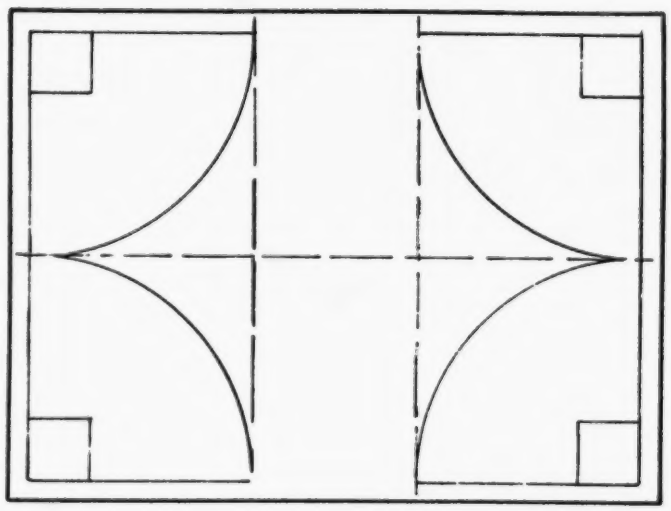
150 MAXIMUM ENROLLMENT

64,800 sq. ft.
2 UNITS OF D



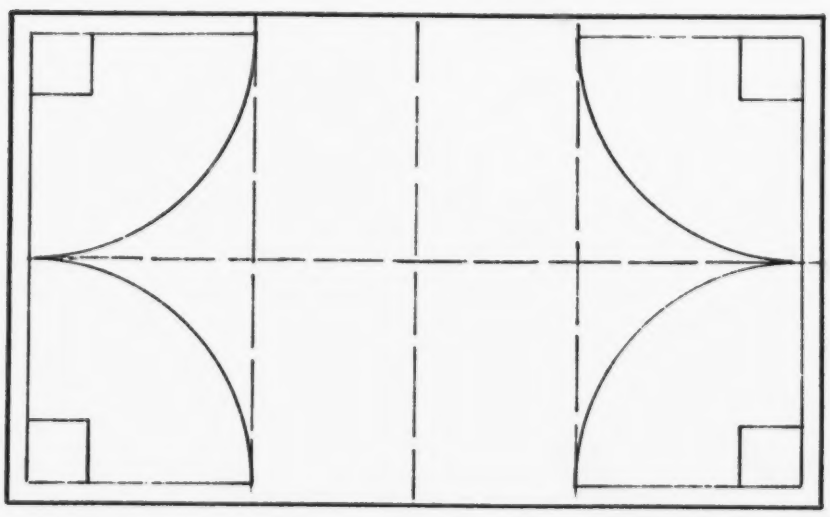
300 MAXIMUM ENROLLMENT

129,600 sq. ft.
4 UNITS OF D



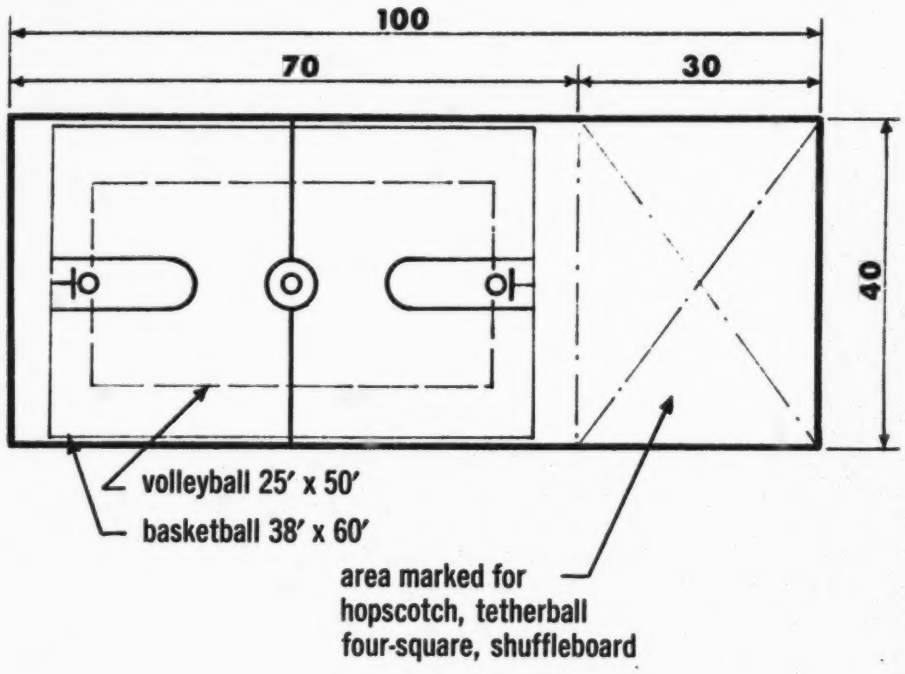
450 MAXIMUM ENROLLMENT

172,800 sq. ft.
4 UNITS OF D
PLUS 2 UNITS OF E



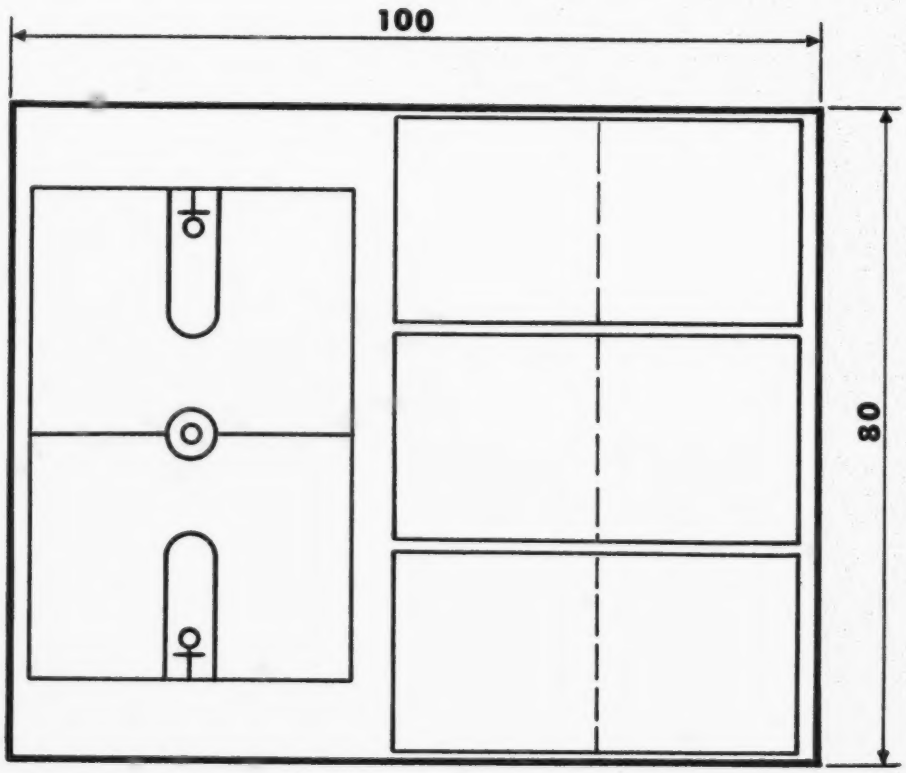
600 MAXIMUM ENROLLMENT

216,000 sq. ft.
4 UNITS OF D
PLUS 4 UNITS OF E



ONE-HALF UNIT ½F

SHOWING TYPICAL
GAME ACTIVITIES

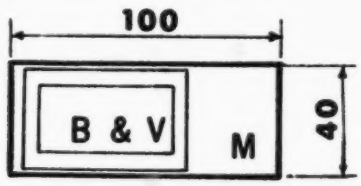


BASIC UNIT F

EACH ENROLLMENT
INCREMENT OF 75
REQUIRES 1 MODULE
OF SPACE 80′ X 100′

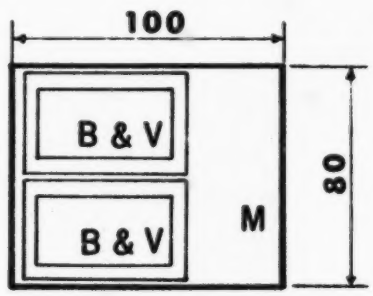
LAYOUT WILL VARY

HARDCOURT AREAS FOR GRADES 4, 5, and 6



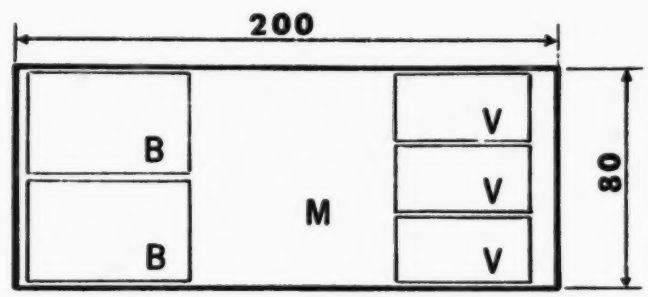
UP TO 35 ENROLLMENT
(1 room school)

4,000 sq ft.
½ UNIT F



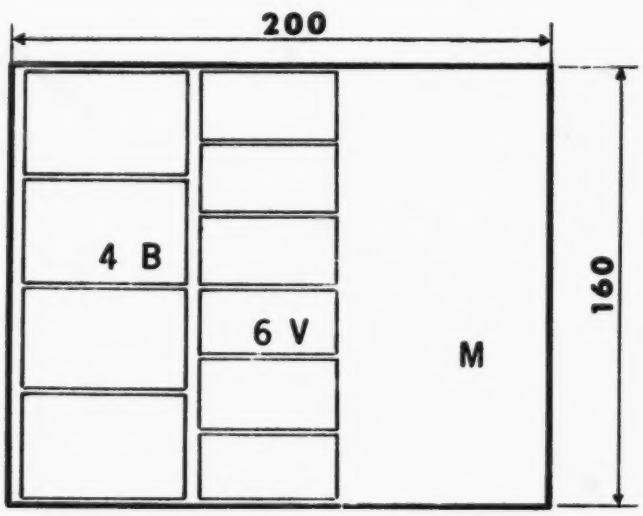
75 MAXIMUM ENROLLMENT

8,000 sq ft.
UNIT F



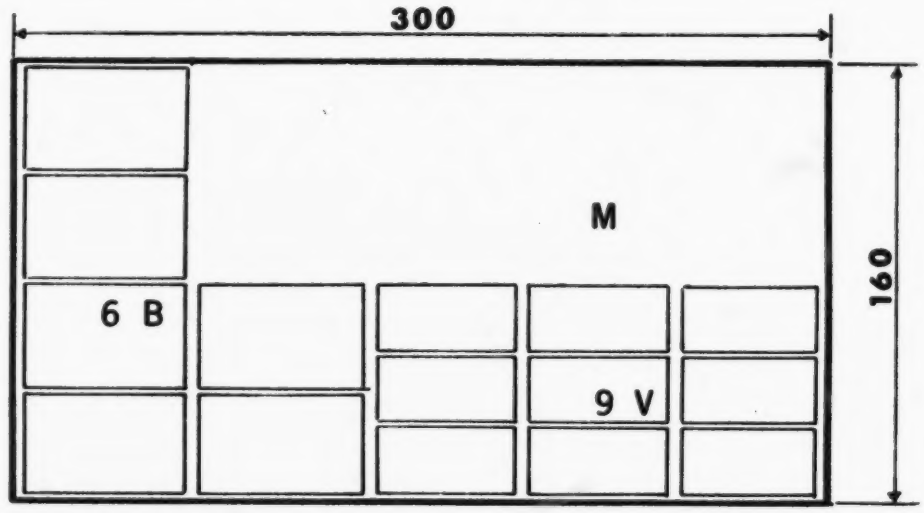
150 MAXIMUM ENROLLMENT

16,000 sq. ft.
2 UNITS OF F



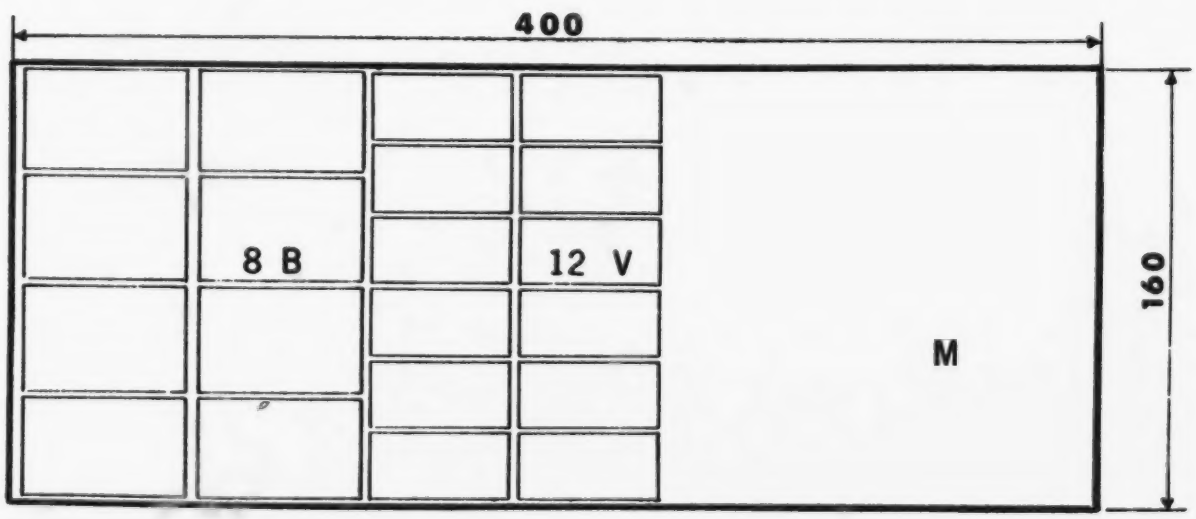
300 MAXIMUM ENROLLMENT

32,000 sq. ft.
4 UNITS OF F



450 MAXIMUM ENROLLMENT

48,000 sq. ft.
6 UNITS OF F

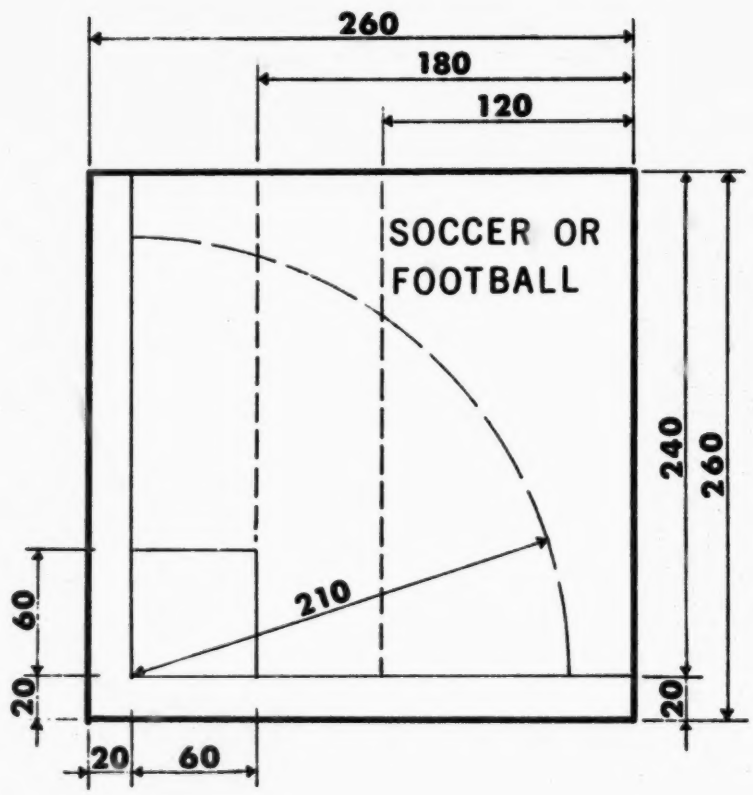


600 MAXIMUM ENROLLMENT

64,000 sq. ft.
8 UNITS OF F

SYMBOLS
B basketball
V volleyball
M miscellaneous games

FIELD & HARDCOURT AREAS FOR GRADES 7 THROUGH 12

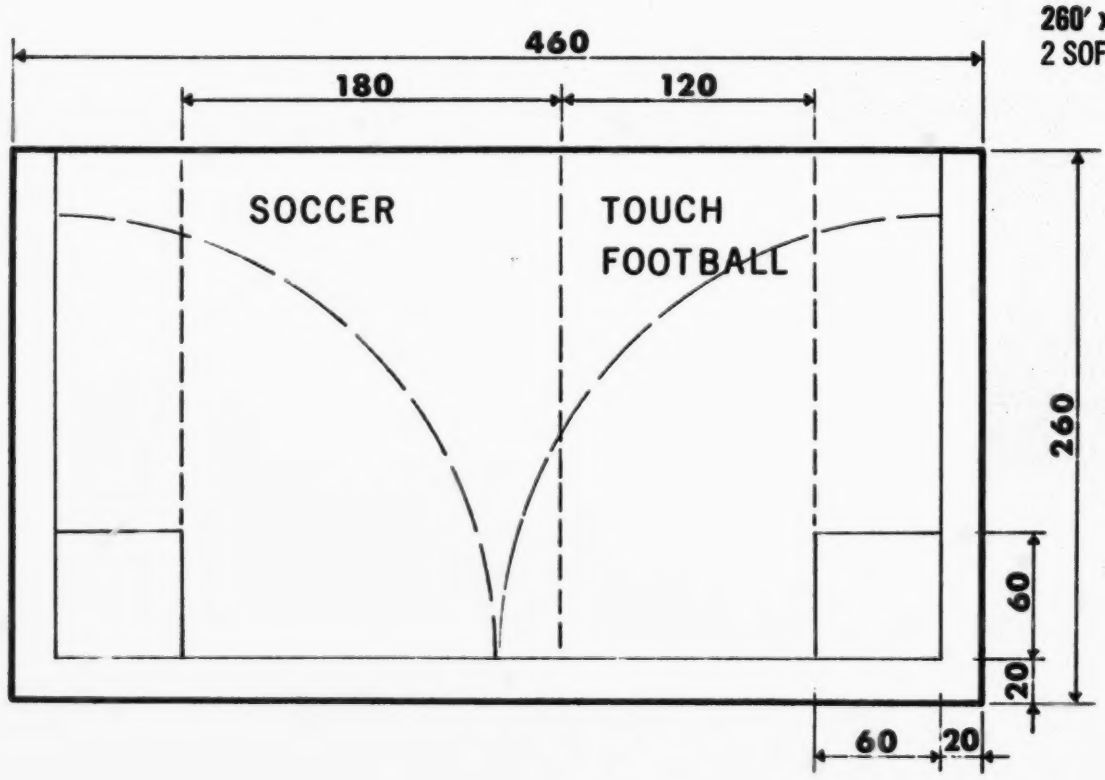


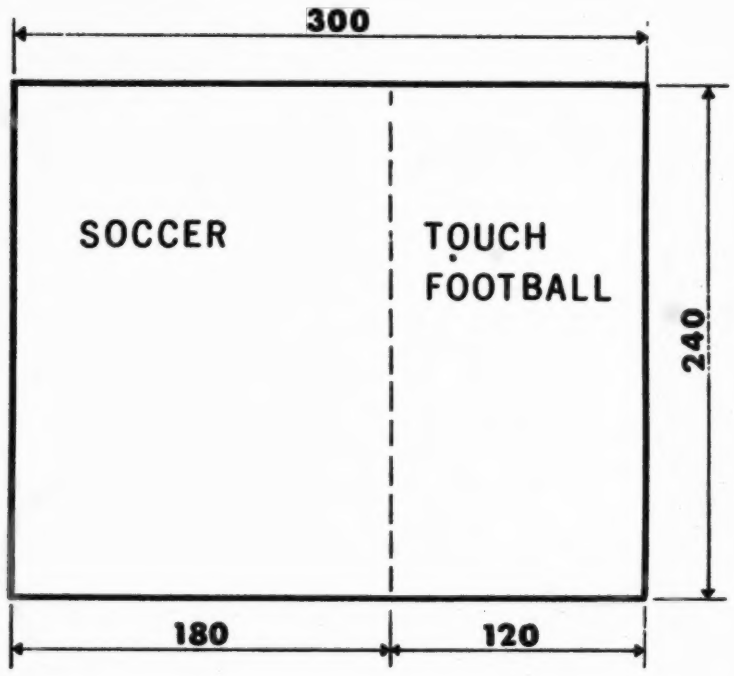
BASIC UNIT G

260′ x 260′ = 67,600 sq. ft.
1 SOFTBALL OR 1 FIELD AREA

BASIC UNIT H

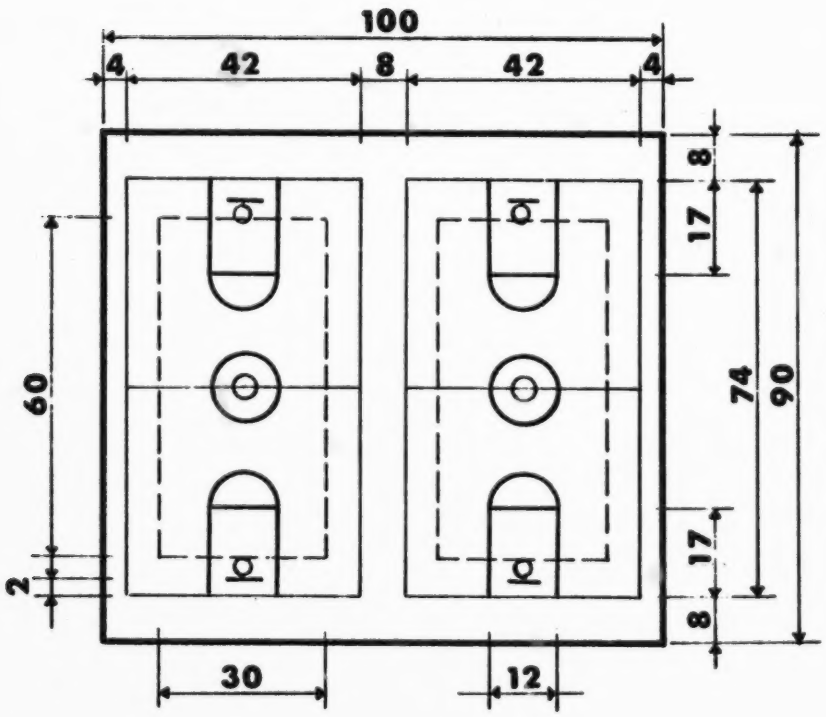
260′ x 460′ = 119,600 sq. ft.
2 SOFTBALL OR 2 FIELD AREAS





BASIC UNIT I

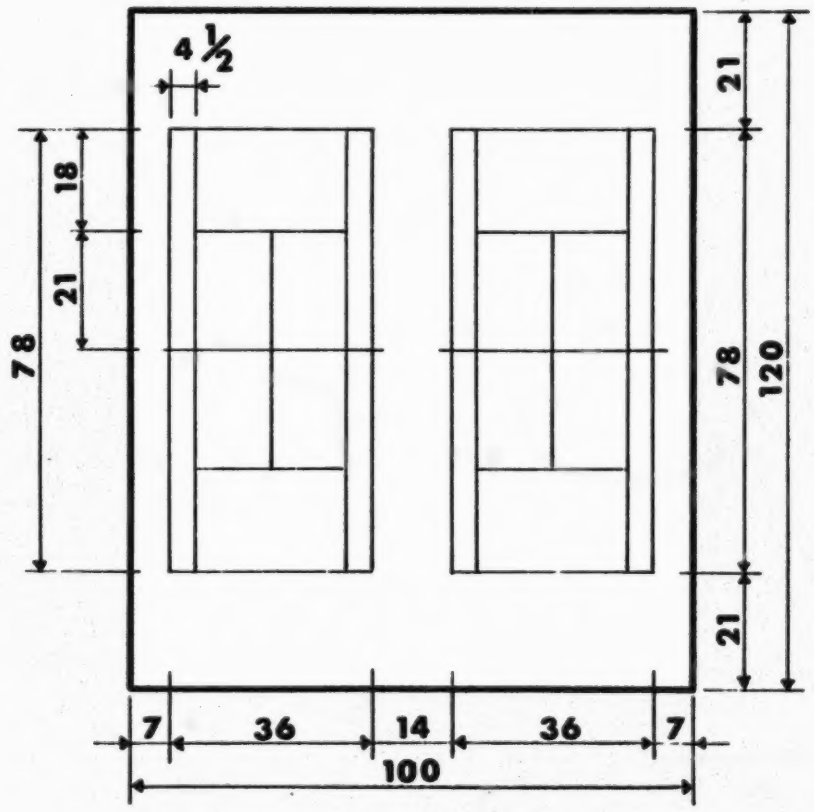
240′ x 300′ = 72,000 sq. ft.
MULTI-USE FIELD AREA



BASIC UNIT J

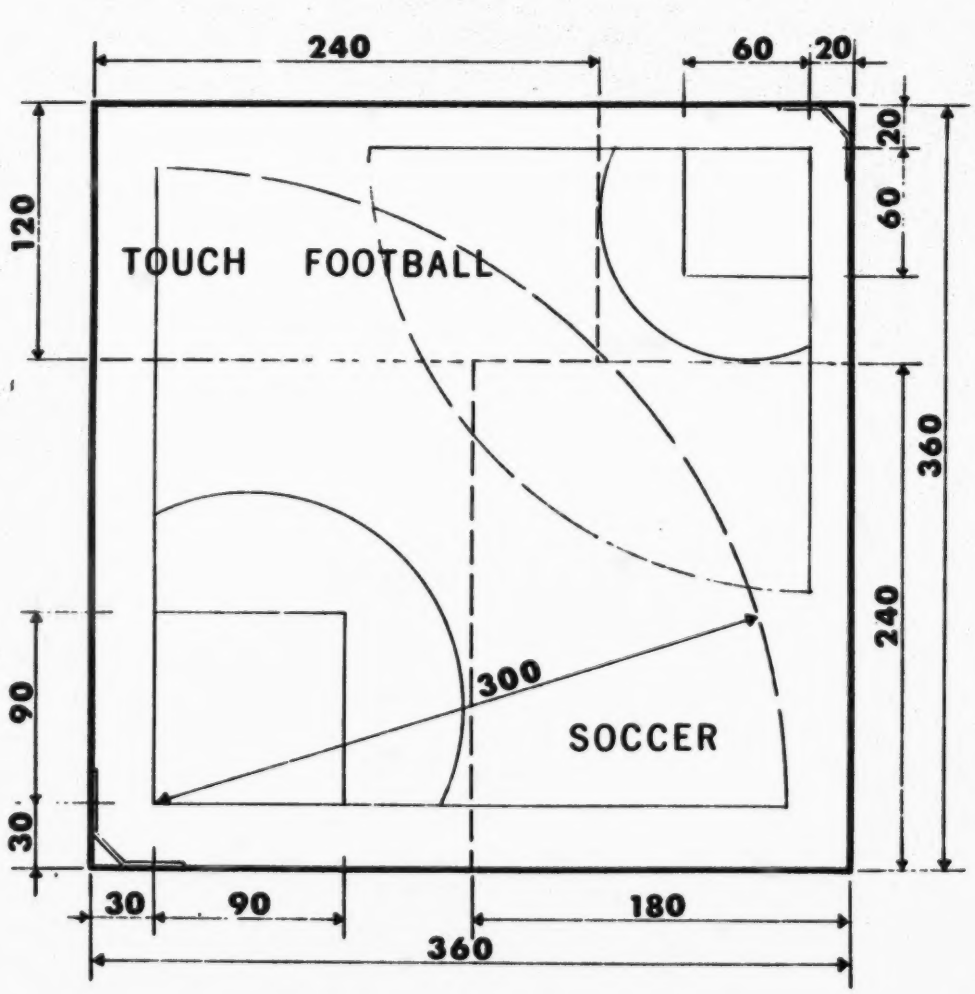
90′ x 100′ = 9,000 sq. ft.
BASKETBALL OR VOLLEYBALL

FIELD & HARDCOURT AREAS FOR GRADES 7 THROUGH 12



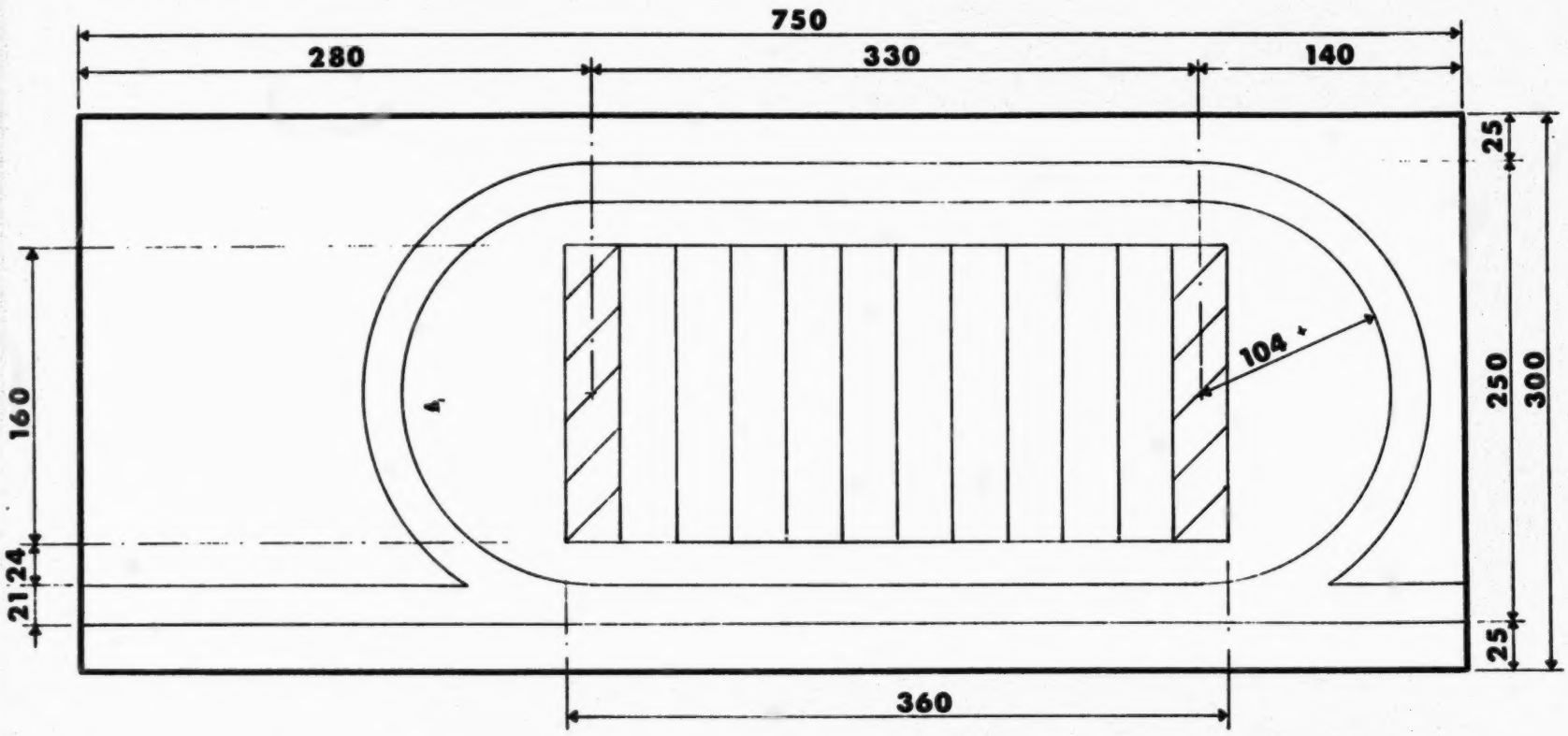
BASIC UNIT K

100′ x 120′ = 12,000 sq. ft.
2 TENNIS COURTS



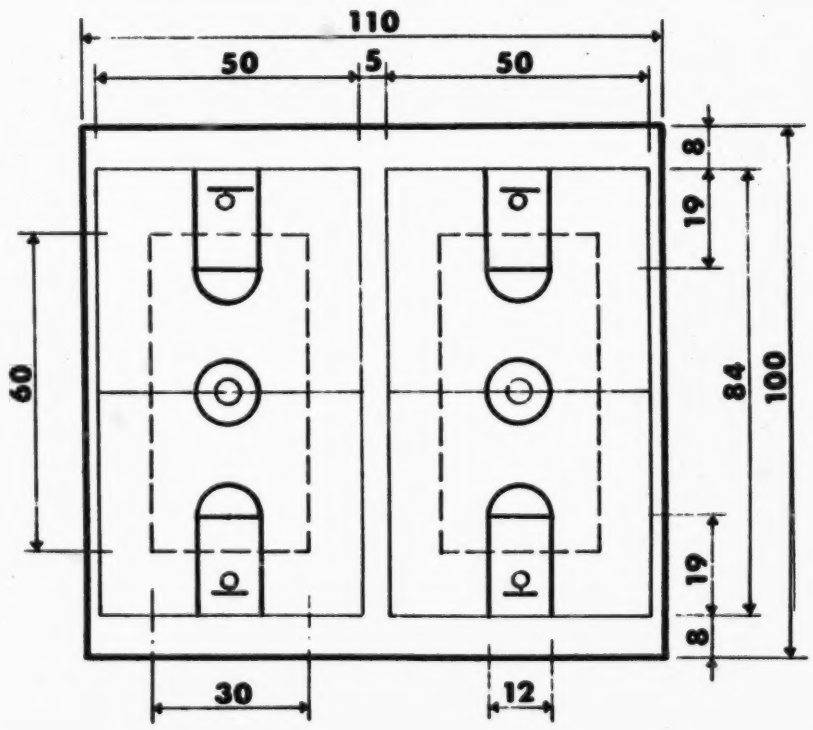
BASIC UNIT L

360′ x 360′ = 129,600 sq. ft.
1 BASEBALL & 1 SOFTBALL
OR 2 FIELD AREAS



BASIC UNIT M

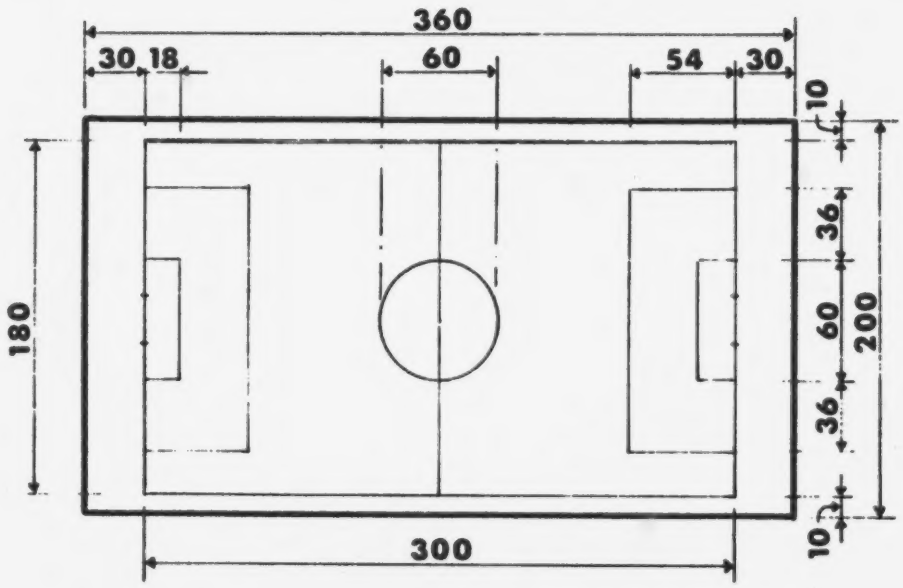
300' x 750' = 225,000 sq. ft.
FOOTBALL & TRACK



BASIC UNIT N

100' x 110' = 11,000 sq. ft.
BASKETBALL OR VOLLEYBALL

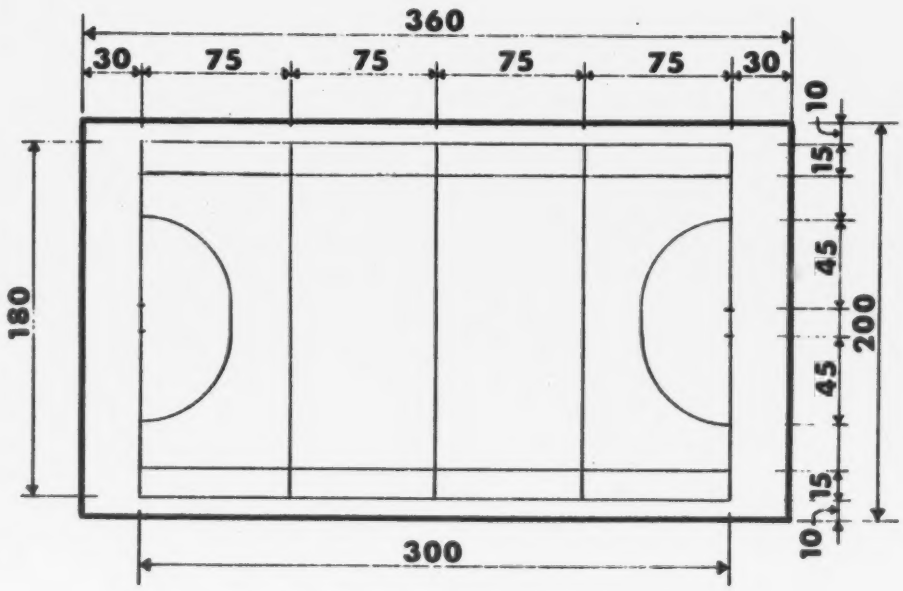
FIELD & HARDCOURT AREAS FOR GRADES 7 THROUGH 12



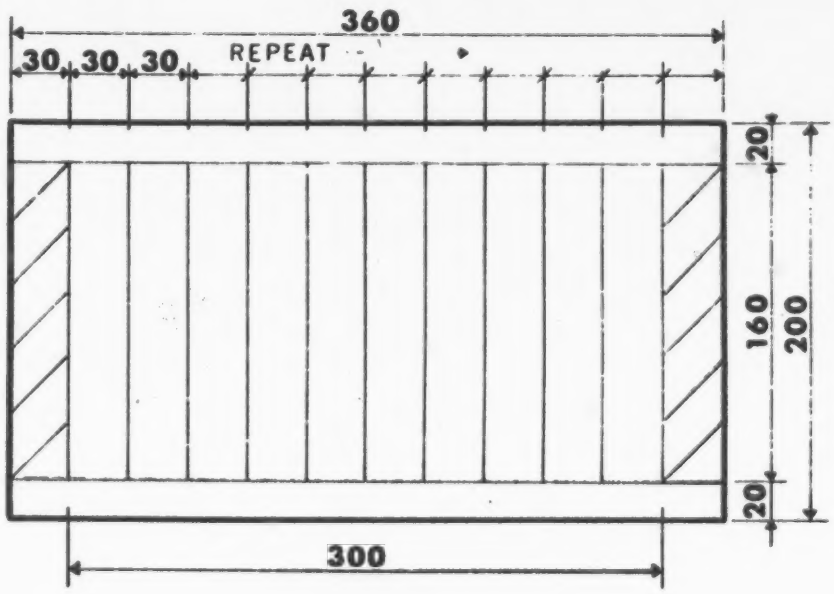
BASIC UNIT O

200′ x 360′ = 72,000 sq. ft.

SOCCER



FIELD HOCKEY

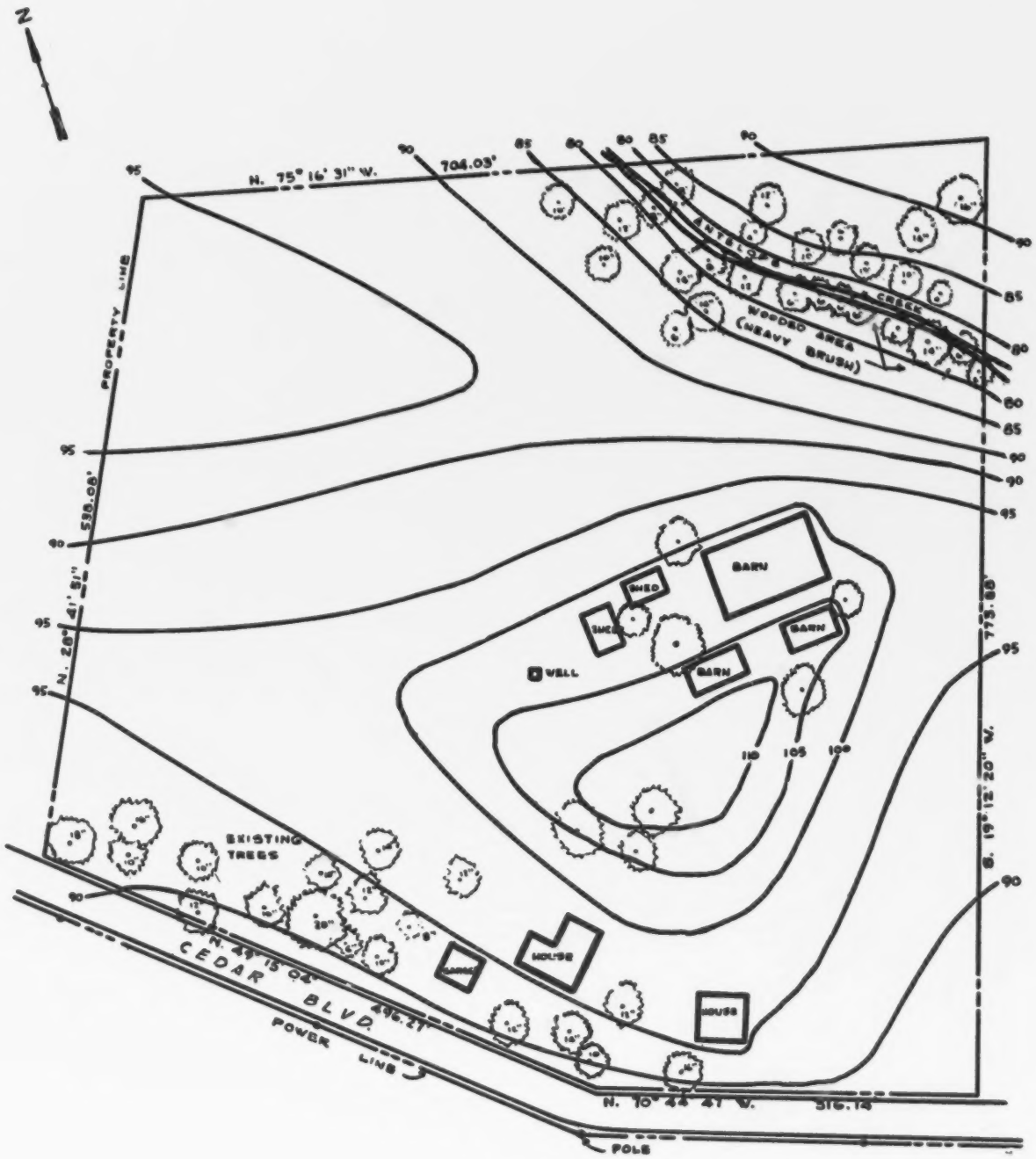


TOUCH TACKLE FOOTBALL

A SITE PLAN DEVELOPMENT PROCEDURE

Step 1

Obtain a topographical survey of the site.



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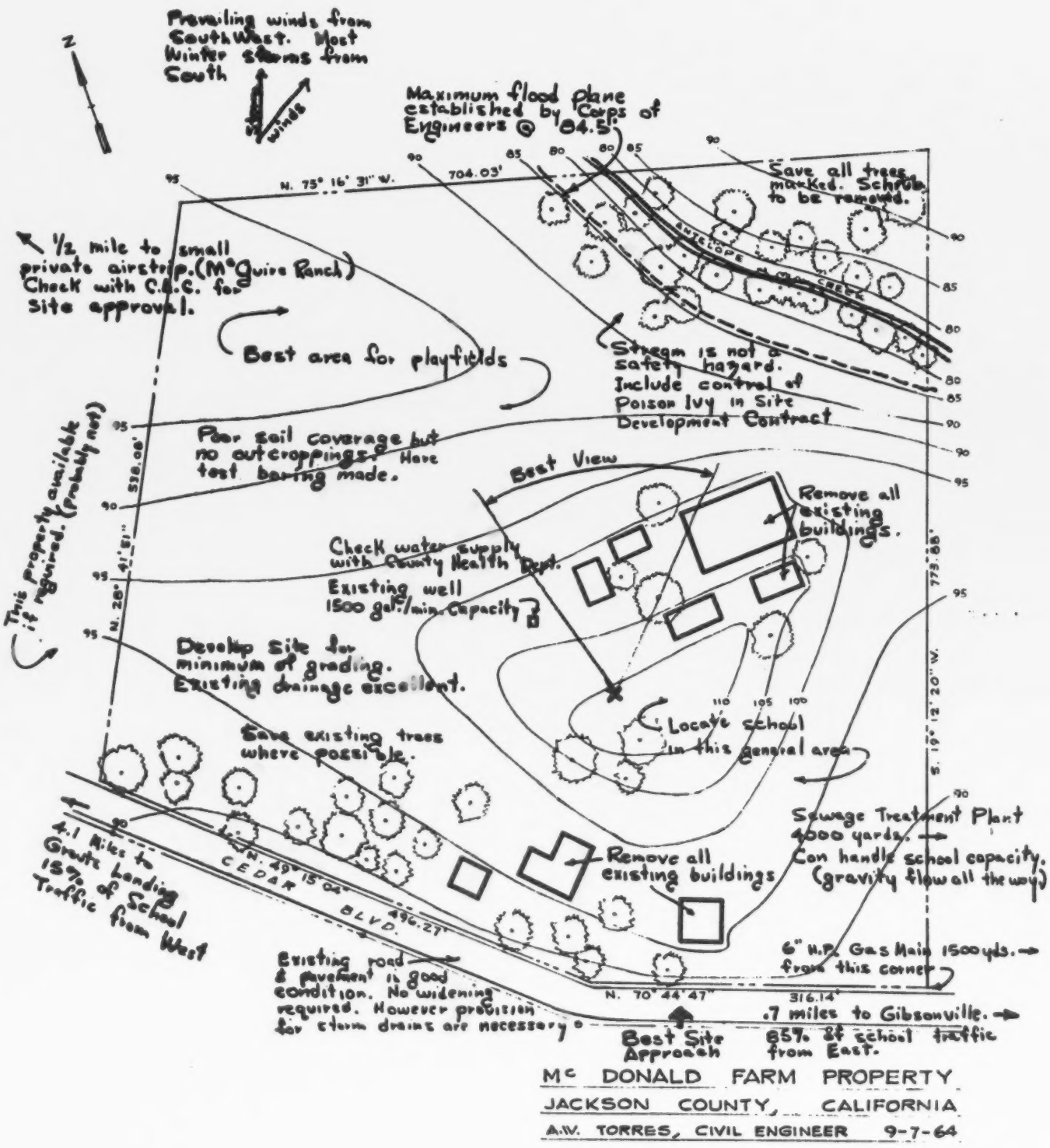
Step 2

Make repeated visits to the site to gain a feeling for the character of the site, to collect information, and to begin a land-use analysis. Usually the architect takes a print of the topographical survey directly to the field. From actual on-the-site observations, he marks down all pertinent information which might influence the site planning such as views, sculptural land forms, the quality of the soil, trees, outcroppings, streams, and all other existing natural attributes. He makes this study so that he is able to visualize the site as it will be at completion of the developed school.


Prevailing winds from South West. Most Winter storms from South
Winds
Maximum flood plane established by Corps of Engineers @ 84.5'
N. 75° 16' 31" W.
704.03'
Save all trees marked. Schrub to be removed.
½ mile to small private airstrip. (McGuire Ranch) Check with C.A.C. for site approval.
Best area for playfields
Stream is not a safety hazard. Include control of Poison Ivy in Site Development Contract
Poor soil coverage but no outcroppings. Have test boring made.
Best View
Remove all existing buildings.
Check water supply with County Health Dept.
Existing well 1500 gal./min. Capacity?
This property available if required. (Probably not)
N. 28° 41' 51" E.
518.00'
Develop Site for minimum of grading. Existing drainage excellent.
Locate school in this general area
Save existing trees where possible.
S. 19° 12' 20" W.
773.88'
Sewage Treatment Plant 4000 yards. → Can handle school capacity. (gravity flow all the way)
4.1 Miles to Grants Landing 15% of School Traffic from West
N. 49° 15' 04" E.
496.27'
CEDAR BLVD.
Remove all existing buildings
Existing road & pavement in good condition. No widening required. However provision for storm drains are necessary.
6" H.P. Gas Main 1500 yds. → from this corner
N. 70° 44' 47" E.
316.14'
.7 miles to Gibsonville. →
Best Site Approach
65% of school traffic from East.

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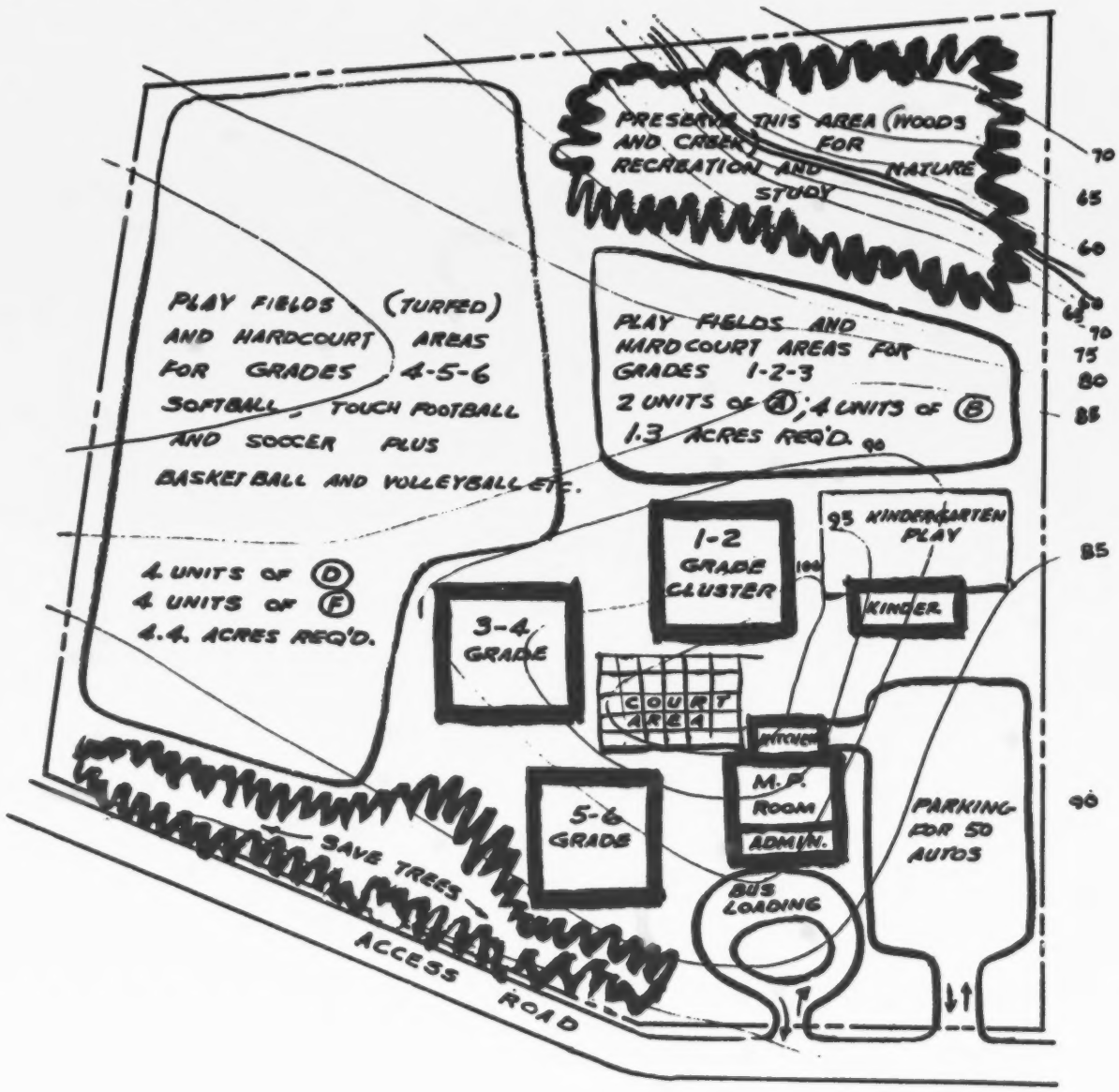
Step 3

Prepare diagrammatic studies based on all collected information and an understanding of the site, plus the program of what facilities will be required for the finished school. It is necessary for the architect to prepare many diagrammatic studies in order to exploit various possibilities. They are usually executed in rapid freehand sketches, which are seldom shown to the client; yet, these studies are most critical in the planning process since conceptual ideas are developed during this phase.

The architect can benefit by collaboration at this point with the clients, school planning specialists, landscape architects, engineers, and other experts in various fields of specialized knowledge, who, in a free interchange of ideas, generally contribute such specific information that the best plan concepts evolve almost spontaneously.

In the following example which illustrates this four-step procedure, the calculations were made for the site requirements of a K–6 school, with an assumed program of two kindergartens and with up to 300 pupils in grades, one, two, and three and up to 300 pupils in grades four, five, and six.

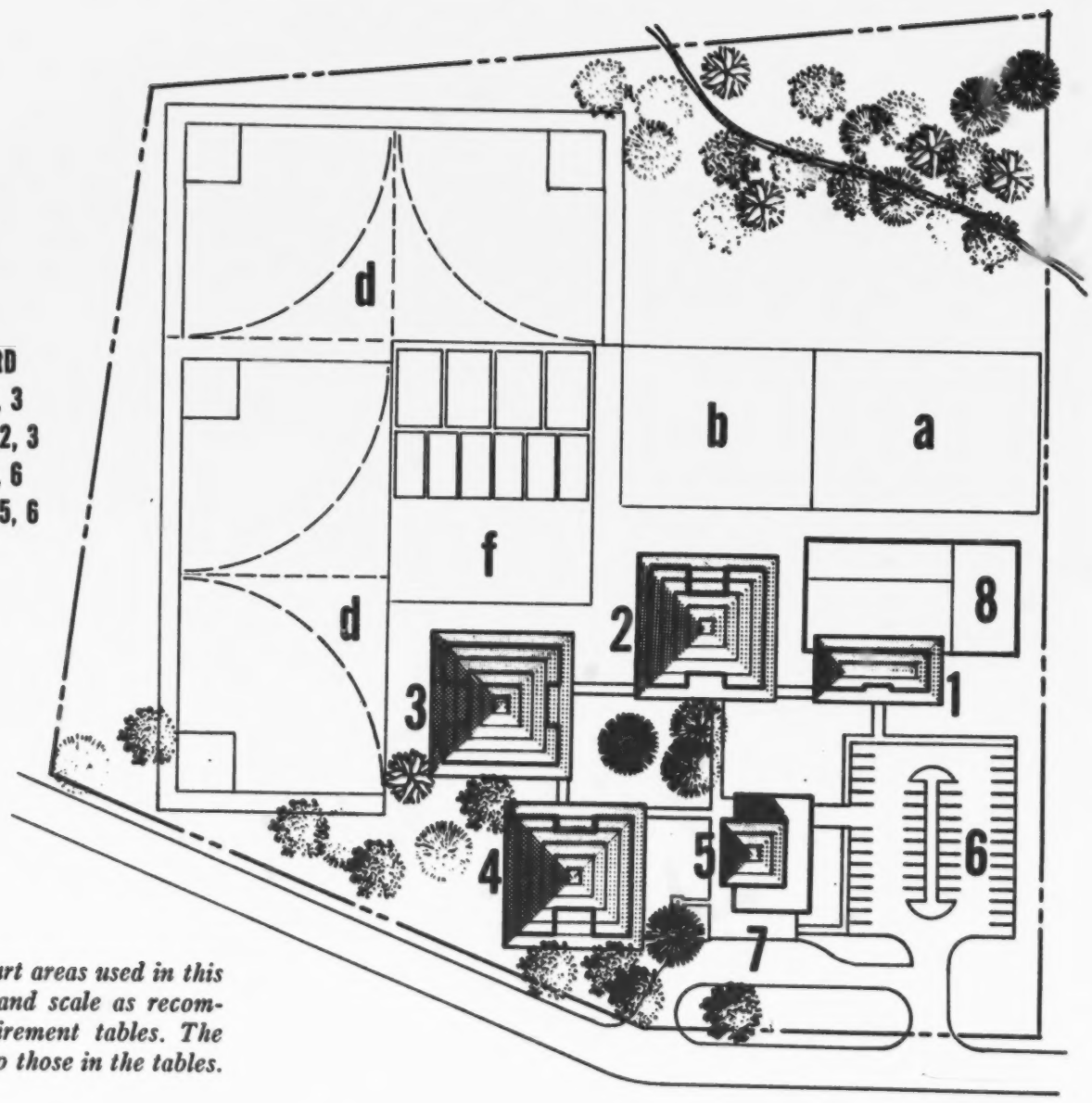
The major space allocations in approximate scale were determined by using data from the tables and layouts in this guide. This includes the acreage required for play fields and hardcourt areas for each of the grade levels, for parking, and for buildings and grounds.



Step 4

Develop a refined site plan. (The architect should not proceed beyond *Step 3* until the school buildings are planned in considerable detail.)

1 KINDERGARTEN
2 GRADES 1 & 2
3 GRADES 3 & 4
4 GRADES 5 & 6
5 M.P. & ADMIN.
6 PARKING
7 BUS LOADING AREA
8 KINDERGARTEN PLAY YARD
a PLAYFIELDS/Grades 1, 2, 3
b HARDCOURTS/Grades 1, 2, 3
d PLAYFIELDS/Grades 4, 5, 6
f HARDCOURTS/Grades 4, 5, 6



The playfields and hardcourt areas used in this plan site are in quantity and scale as recommended by the site requirement tables. The symbols used correspond to those in the tables.

ESSENTIAL SURVEY DATA

1. *Title of survey, property location, certification, and date*
2. *Scale and compass orientation*
3. *Tract boundary lines, courses, and distances*
4. *Names of abutting property owners*
5. *Bench mark with assumed elevation*
6. *Names and locations of all existing road right-of-ways on or near the tract*
7. *Location of all existing structures on the site, including buildings, foundations, bridges, wells, cisterns, walls and fences, and rock outcroppings*
8. *Location, type, size, and flow of all existing storm and sanitary sewers on or contiguous to the tract, including top and invert elevations of all manholes, and inlet and invert elevations of other drainage structures*
9. *Location of roads, drives, curbs, gutters, steps, walks, paved areas and the like, indicating types of material or surfacing*
10. *Location, type, and size of all water and gas mains, meter boxes, hydrants, and other appurtenances*
11. *Location of all utility poles, telephone lines, and power lines, with indication of nearest leads either on-site or off-site; pertinent information and ownership of all utilities*
12. *Location of all swamps, springs, streams, drainage ditches, lakes, and other bodies of water; line of maximum flood plane if applicable*
13. *Outline of wooded areas; location of trees, identification of trees by type, and identification of trees with trunks over eight inches in diameter at waist height*
14. *Road elevation for all improved roads on or adjacent to property; improved gutter elevations on property line side at intervals of 50 feet*
15. *Elevations throughout the site sufficient to develop complete and thorough contour map*